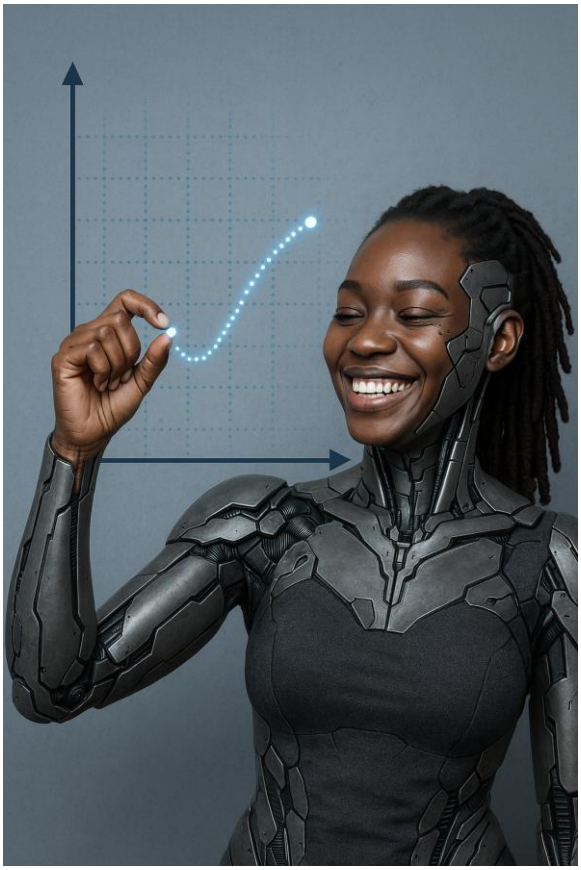
Introduction to Impossible Probability,

Statistics of Probability or

Probabilistic Statistics. VOL 1

Dr Rubén García Pedraza



Introduction to Impossible Probability,

Statistics of Probability or Probabilistic Statistics

Dr Rubén García Pedraza

2015, Revised Edition, for Print and Ebook Version.

Translated into English in September 2025,

using ChatGPT, keeping the translation as faithful as possible to the original

Preliminary Words [2015 edition]

Introduction to Impossible Probability, Statistics of Probability or Probabilistic Statistics is one of those works in which a deep bond between mathematics and philosophy can be found.

It always asks about the ultimate purpose of science, wrapped in a veil of uncertainty and relativity.

There is always a halo of indeterminism, since in the end it is chance itself—the random variations of what we call reality, although we do not quite know what it is—that becomes the cause of causes.

From an interpretation not devoid of a certain nihilism, it offers a different vision of mathematics applied to statistics and probability.

The work is organized into a series of sections whose exposition unfolds in a continuous manner, each section and each paragraph being numbered in an ordered numerical sequence, in a way that facilitates reading.

Introduction to Impossible Probability first appeared in December 2011, in a limited edition of which a few copies still remain. It was later modified into a new ebook version that appeared in January 2013, whose first revision dates from January 2014. The version now presented is the latest update, based on contributions from January 2015.

To all readers, many thanks, and enjoy,
Rubén García Pedraza

Preliminary Words to the English Translation

The work presented here, *Introduction to Impossible Probability*, is essential for understanding the original meaning of the Global Artificial Intelligence. Its origins can be traced back to my writings in 2002 on Astro-ecology, the science that understands the cosmos as a single environment that must be studied from a unified, single science. In essence, this is what the Global Artificial Intelligence seeks to achieve. At the same time, in 2002 I developed the formulations of Impossible Probability, beginning in the early hours of September 11, 2001 with the *Impact of the Defect*, which was later expanded into the *Second Method* on October 16, 2002.

In essence, the entire original philosophy is based on the Cartesian idea of the necessity of a margin of doubt in any scientific proposition. This Cartesian margin of doubt would later, in the application of Karl Popper's falsificationism to inferential statistics, be understood as *critical reason*, the necessary and acceptable margin of error in any provisionally true proposition.

Impossible Probability maintains and deepens the Cartesian and Popperian rationalist tradition, enriching it with new philosophical contributions and some mathematical formulations. It rests on the understanding that the necessity of a margin of doubt in the existence of every provisional truth stems from the human limitation of being incapable of accessing the noumenon of things. It is this a priori limitation—the metaphysical limitation of the human condition—that requires humans to accept errors. Yet this does not mean that the noumenon cannot be known by other means. For this reason, in *Impossible Probability* we propose the construction of the Global Artificial Intelligence: a machine capable of making real the dream of a unified science, a single science that may lead us to the reason for all things. The creation of a global matrix, which may ultimately be resolved in a single equation, will provide the equation that solves the matrix, the very reason for everything.

Due to the special conditions in which I find myself—explained in other documents available on Internet Archive and Amazon—I am compelled to publish as quickly as I translate. For this reason, the English version of *Introduction to Impossible Probability* will be released in volumes as the translation progresses.

September 1, 2025, London, Leytonstone, 18:32

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Introduction

to

Impossible Probability

Statistics of Probability

or

Probabilistic Statistics

Dr García Pedraza

VOL 1

2 Sept 2025

“What did you do with the other guys

Did people brush their teeth

In the concentration camp”

Ruben Garcia Pedraza

Poem “*Mr Saddle”*

At Stratford Library Poetry Club

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1. Introduction to Impossible Probability

1.1. Every idea is a mental representation produced neurally, brain physiology.

1.2. Philosophical ideas are those objective mental representations not necessarily positive that are defined within the limits of reason and consciousness.

1.3. Scientific ideas are those objective mental representations of logical or empirical relations, accepted by a model of scientific policy, a model of scientific policy that is scientific insofar as it is grounded in a philosophical model, and political insofar as it is founded upon the ideals determined by an ideology.

1.4. To define is to relate ideas in dialectical equality.

1.5. A scientific definition is that relation of equality of ideas accepted by a model of scientific policy. Every scientific definition of reality will be a political definition of reality.

1.6. Truth is what is certain.

1.7. Certainly, there are different kinds of truth; truth is not one-dimensional, it is dialectical.

1.8. What is certain is that which occurs.

1.9. But of what occurs, only a part is known.

1.10. The human being by definition is a being limited in space and time; he cannot know all space, nor can he know all time. Empirically he only knows the space of his time, the history of his existence; the rest is social mediation, the transmission of history.

1.11. The absence of complete knowledge is the cause of incomplete knowledge of reality, which requires that all knowledge be partial. Only samples of space-time are

known. No possible knowledge is impartial, thus it is not neutral; human knowledge by definition is ideological, political.

1.12. Knowledge aims to know truth, yet truth is not one-dimensional, it is dialectical.

1.13. Truth is what is certain, and what is certain is that things occur, and it is the knowledge of the things that occur which is the object of knowledge, depending on the ideological perspective of scientific policy.

1.14. What is right, in any case, should be to know the truth insofar as it is real truth, moral truth; but in reality, politically what is right will be to know what is convenient to know.

1.15. All correct praxis will be politically correct insofar as it is morally political; all ethical praxis will be logically ethical insofar as it is logical praxis.

1.16. All praxis will be ethically moral as long as politics is logical; a political morality devoid of all logic can only lack all ethics.

1.17. Truth exists, yet it is not one-dimensional, it is dialectical.

1.17.1. Truth in itself is what occurs in reality in itself, the moral behavior of the universe, which, insofar as what occurs in the universe may be infinite, is a reality in itself that cannot be completely known by a limited nature that only knows space-time samples.

1.17.1.1. The human being, insofar as he only knows samples of what occurs, cannot know absolutely everything that occurs, and therefore cannot fully know reality in itself.

1.17.1.2. Moral truth is moral because the moral should always affirm truth. But a limited reality such as the human one, which only knows samples, cannot fully know reality in itself, and thus will never come to absolutely know the true moral behavior of the universe.

1.17.1.3. If morality should affirm the truly true truth, those logically ethical propositions deduced from the universe in itself, reality itself, and the human being only knows space-time samples, then no logically human proposition can be morally absolute. It will only be true within a margin of logical or moral incoherence, the margin of error within which scientific policy accepts the contradictions of science.

1.17.2. The human being only knows samples, and samples are samples of what happens outside himself, they are samples of what occurs in space-time. The sample is that part of reality in itself, moral truth, the moral behavior of the universe, which is shown to humanity in the form of appearance or phenomenon.

1.17.2.1. Of the moral universe, the human being, insofar as he is limited, cannot know the absolute idea, since he only knows incomplete, ideologically moral truths, apparent forms of a reality he truly does not know, and from which only logical deductions can be made of what happens outside himself.

1.17.2.2. Insofar as the human being cannot know the absolute moral idea of the universe, he can only access that sample which outside himself is shown to humanity. The appearance of what occurs in the universe is what is shown to the human being. And insofar as phenomenon, negative aspect of real reality, what really exists is an existence that only shows itself in the form of appearances, in which is included the very appearance of human existence.

1.17.2.3. Human existence, insofar as it is a form of apparently moral truth, is constituted as human phenomenon—a certain kind of being, human being—which, as an appearance of being, does not have absolute reliability of existence. Insofar as it is in itself, like everything that reality shows of itself, appearance of what in theory should be or exist, moral truth.

1.17.2.4. The human being in itself, transformed into appearance, attempts to radically define himself as real category of being-existence. And in the moral struggle for reality, the global or holistic, systemic definition—history, space-time—generates the different precedents and antecedents to being, moral models for the survival of the species. The struggle to be, in itself and outside itself, as species, transforms itself into a paradigmatic struggle, where reason and revolution, consciousness, struggle to reaffirm themselves in their being outside all objective and subjective alienation, material or cognitive; reason and revolution as the only reliable definition of being-substance, self and matter. The struggle for the political definition of being.

1.17.2.5. The human being, insofar as incomplete, cannot know the moral behavior of the universe, only parts of reality in itself—what outside himself the real universe

shows: appearances, phenomena, events. And in this incomplete knowledge of reality, partial, not impartial, not neutral, the struggle for political definition in its higher form will be scientific struggle, between different models of scientific policy, to be paradigm of science.

1.17.2.6. Insofar as the human being only knows samples of what happens, it cannot be absolutely true, only partially so. This moral truth in itself, outside itself partial or apparent, becomes scientifically for itself a political definition of reality, and the being…

1.17.3. The moral truth of the behavior of the universe, reality in itself, that truth which theoretically is the truly true truth, insofar as absolute truth, is a truth that the human being cannot know due to his limited nature. He can only know samples of what happens, because what is certain is that things occur, and the only way to know what happens, at least in part, is by accepting that he can only partially know reality, and that insofar as knowledge is partial and not absolute it can only be through the acceptance of errors—errors that will only be accepted if they are politically convenient in accordance with his ideals, his ideology.

1.17.3.1. Of moral truth, science can only know a part; that part of truth which science can know is political, or morally political.

1.17.3.2. Truth in itself, truly real, moral truth, is a truth beyond human knowledge—an absolute moral truth impossible for science to know, which will only render itself morally true in its political form.

1.17.3.3. Moral truth in itself, outside itself as phenomenon or appearance, is transformed for itself absolutely into political morality.

1.17.3.4. To understand the political nature of truth outside itself, it is necessary to define what study, philosophy, and science are, because politically only that will be truth which politically it is of interest to regard as truth. When a model of scientific policy does not deem it of interest that a proposition be true, then it will be considered politically false.

1.17.3.5. The greater the incoherence or contradiction among the set of propositions that compose a political theory of science in relation to reality itself, reality in itself, the

true moral behavior of the universe, the greater the frequency of crises within that theory of science.

1.17.3.6. Every scientific truth is morally political, but not necessarily every political morality must be logical or ethical.

1.17.3.7. In the struggle to be the paradigm of science, if humanity were to have sufficient or infinite time, the paradigm of political theory of science that would prevail would be that which is as isomorphic as possible, minimizing the contradiction between the moral truth of the universe and the politically moral truth of science, in the reliable progress of the identity between idea and reality. Scientific policy should be positive, within the margin of error one is prepared to accept.

1.18. Study is every procedure by which new knowledge is acquired.

1.19. It is necessary to distinguish between two models of study: studies with didactic or autodidactic ends (learning), and scientific study.

1.20. Didactic or autodidactic study, learning, is every procedure whose object is that a rational being individually acquires new knowledge in relation to his or her prior or previous individual knowledge; study in learning has the object of improving individual knowledge.

1.21. Scientific study is every procedure whose object is to acquire knowledge that is new for all humanity; study in science has the object of improving universal knowledge.

1.22. The origin of science is philosophy, and philosophy is the global knowledge of all that occurs—a knowledge that, being global, does not imply that it is complete. It only implies that it is holistic knowledge, insofar as philosophy lacks positive boundaries between fields of knowledge. In philosophy, the boundaries of knowledge must be exclusively rational.

1.23. Philosophy is the global and incomplete knowledge of everything that happens, under the examination of the philosophical method. The origin of the philosophical method is the syllogism, upon which all dialectics is established. The method of Impossible Probability will be the syllogism of tendency.

1.24. Throughout the 20th century, especially within positivism, the syllogism as a method of new knowledge was debated. Wittgenstein in particular rejected the idea that the syllogism was capable of contributing new knowledge. Nevertheless, part of the rejection that syllogism has suffered throughout the history of philosophy may be the result of an incomprehension of dialectics.

1.25. Logically, syllogism has limits. Logically, from false premises only erroneous conclusions can be deduced, from which it follows that philosophical activity—praxis—must demonstrate, within the political margin of error one is prepared to accept, the coherence of empirical propositions in order to show whether or not they tend to be sufficient reason for truth.

1.26. The problem of syllogism is not the very nature of logic, which is ethical. The problem of syllogism lies in whether the propositions are true or not, which requires the rational critique of propositions. Rationally critical scientific policy will only become provisionally objective, within the margin of error one is prepared to accept.

1.27. Philosophy, in this way, is synthesized as *incomplete*, but global, and political knowledge, in philosophical activity—praxis—according to which truth of propositions is provisionally accepted. Something is said to have *provisional* validity because if logically all knowledge is partial it cannot be absolute, at most it can be provisional. Praxis, as logical activity, necessarily cannot be limited to demonstrating truth only formally; praxis will only truly be ethical if it demonstrates truth in practice. Demonstrating truth in practice implies transforming apparent truth into a true real truth. All science is transformative: first through scientific revolutions that transform the objective conditions of social production, and secondly through social transformations that are the product of transformations in social production.

1.28. A proposition is partially or provisionally true as long as it is rationally critical, within the margin of error one is prepared to accept in scientific policy.

1.29. Science will be the set of logical propositions provisionally produced by praxis, the provisional objective reality, in order to politically define reality.

1.30. Every empirical proposition or hypothesis accepted in philosophical praxis—rational critique—once accepted as rationally true, becomes part of objective reality, that is, science.

1.31. The rational critique of empirical hypotheses will result from contrasting empirical hypotheses against critical reasons, whose ideal will always be the ideal critical reason.

1.32. To establish the contrast of hypotheses, which is in essence a contrast of ideas, in the affirmation of propositions that form the empirical sciences, there is one science that is shown to be absolutely necessary, without being particularly empirical: mathematics.

1.33. Mathematics is a science that is not empirical, but it is science, insofar as it is the language of science and the study of the language of science. Thus, it must necessarily be logical. And in mathematical logic, ethics reaches its most logical expression: the *idealization* of reality for the realization of the ideal. This implies logical praxis in the definition of ideals, and the logical consequence of ideals: the ethical realization of the ideal, and the contrast between idea and reality, which is the object of critical reason.

1.34. At this point, it must be said what Impossible Probability is. And if there is any way to define Impossible Probability, it is by affirming that Impossible Probability is a model of statistical probability or probability statistics for the mathematical knowledge of empirical reality, by which to establish hypothesis contrasts in order to demonstrate—within the margin of error—whether an empirical hypothesis, an idea, is sufficiently rational to be true, real—in essence, a contrast of ideas.

1.35. Statistics is one of the fields of mathematical research, defined as that mathematical discipline dedicated to the descriptive or inferential study of reality. In *Impossible Probability*, as a statistical theory, statistics is the study of historical tendencies, since every historical tendency is necessarily a tendency within a determined period of space-time. If a statistical study is carried out on the behavior of particles in a sample, it is studying the behavior of the particles in a determined moment, which implies a time and a space, a particular history. If a study is done on the distribution of men and women in a society, it is a study of a determined distribution of

men and women at a particular moment in history. Every study is, in essence, the study of a determined period of history, social or natural.

1.36. Probability is the study of what happens in chance. By definition, a probability is equal to the frequency of occurrence of an event divided by the total number of occurrences. Therefore, it is the study of what happens. And insofar as it is a stochastic model, dependent on random variables, by chance, then probability is the study of what happens in chance or by chance.

1.37. Insofar as *Impossible Probability* focuses on the statistical study of probability, or probabilistic statistics, by definition statistical probability is the study of what happens in chance and in history. Statistical probability is what happens in the history of chance, or the chance of history.

1.38. To understand the way in which *Impossible Probability* will approach the study of statistical probability, it is necessary to understand what the magnitude "N" means.

1.39. The main innovation introduced by *Impossible Probability* into probability statistics, or statistical probability, is that while in classical or conventional statistics a clear distinction is made between statistics and probability—which, though they share aspects, are normally very differentiated—in *Impossible Probability* any difference between the study of probability and statistics disappears; they are synthesized.

1.40. While in classical or conventional statistics the study of probability is reduced to the study of probability in models where there are different alternatives, in *Impossible Probability* this way of understanding probability is surpassed, toward a model of probability in which every model, as long as it is formed by a sample, can be studied in terms of probability.

1.41. While in classical or conventional statistics, for example, the study of occurrences for each alternative is resolved by calculating the probability of each alternative (the number of occurrences of the particular alternative divided by the total number of occurrences), and in classical or conventional statistics the analysis of a data set is resolved statistically by means of concepts such as the arithmetic mean of

the measurements and the standard deviation relative to the arithmetic mean of the measurements (explained in section four of this work)...

1.42. In *Impossible Probability*, this distinction—between models of alternatives, whose particular occurrence within the total is studied in probability, and models of statistical data to be studied through the traditional arithmetic mean and standard deviation—is a distinction that disappears, through the concept of **N**.

1.43. In classical or conventional mathematical theory, it is often said that a model formed by *N* alternatives, also called options, has *N* options as its *N* alternatives. For example, suppose we toss a coin into the air. The only two options are heads or tails. Then classical or conventional theory would say that *N* is equal to two options, "N = 2." If in a demographic study one wishes to analyze the distribution of men and women across professional sectors, then *N* is again equal to two options—being male or female, "N = 2." [when I wrote for first time this book, the transgender revolution was not very popular, and I defined myself as a man, this translation keeps the original text]. If in representative democratic elections, where different parties may freely present themselves with equal opportunity, the following political parties participate: the Conservative Party, the Liberal Party, the Regionalist Party, the Ecologist Party, and the Socialist Party, then classical or conventional statistics would say that *N* is equal to five options, "N = 5." If we play by tossing a dice into the air, and the dice has six faces, then each of the six faces of the dice will be the possible options; therefore *N* will be equal to six, "N = 6." And in each of these determined models of options, insofar as *N* is equal to the magnitude of options predetermined by the model, the inverse of *N*, "1/N," in each of them will be the theoretical probability that, by chance, each option should have in equal conditions of opportunity.

1.43.1. If we toss a coin into the air, empirically the probability of heads will be equal to the frequency of times heads comes up divided by the total frequency, the empirical probability of tails will be equal to the frequency of times tails comes up divided by the total frequency. And the theoretical probability that each option—heads or tails—should have, in order for there to be equality of opportunity by chance, should be the inverse of *N, "1/N"*:

N = {heads, tails}

1/N = theoretical probability of equal opportunity by chance

1/2 = 0.5

1.43.2. If we study the distribution of men and women across professional sectors, the probability of finding men in a sector will be equal to the number of men in that sector divided by all men and women in that sector; and the probability of finding women in a sector will be equal to the number of women in that sector divided by all men and women in that sector. And the theoretical probability that there should be, in order for there to truly be equality of opportunity for men and women in each professional sector, should be equal to the quotient of one divided by *N*, the inverse of *N, "1/N"*:

N = {man, woman}

1/N = theoretical probability of equal opportunity for men and women

1/2 = 0.5

1.43.3. If in representative democratic elections the Conservative Party, the Liberal Party, the Regionalist Party, the Ecologist Party, and the Socialist Party present themselves, the empirical probability of votes per party will be equal to the number of votes for each party divided by the total number of voters. *N* will be equal to the number of parties, and the theoretical probability—if the distribution of the vote occurred in equal opportunity conditions, with no political bias, with an equal number of votes for each party—would be the inverse of *N, "1/N"*:

N = {Conservative, Liberal, Regionalist, Ecologist, Socialist}

1/N = theoretical probability that all would have the same number of votes by chance, in equality

1/5 = 0.2

1.43.4. If we play by tossing a dice into the air, with six faces, then there are only six options. The probability of each option from one to six will be equal to dividing the frequency with which each number comes up by the total frequency. The theoretical probability of occurrence by chance in equal opportunity will be equal to the inverse of *N, "1/N"*:

N = {1, 2, 3, 4, 5, 6}

1/N = theoretical probability of equal opportunity by chance

1/6 = 0.1666666

1.44. An option is an alternative among other alternatives. To be able to speak of models of options, it is an indispensable condition that there be more than one option. If a model is determined to a single-option model, then it is not a stochastic model; it would be deterministic, and it would not be studied in probability theory.

1.45. The main difference between classical or conventional mathematical theory—which, since October 16, 2002, in my works will be referred to as the *First Method* (although they remain unpublished, and if ever published will undergo deep modifications)—and the statistical method of probability or probabilistic statistics of *Impossible Probability*—which, since October 16, 2002, will be called the *Second Method*—is that, while in the First Method probability theory is applied only to the study of options, in the Second Method probability theory is applied to any set of data, insofar

as every subject can be studied as an option, in the same way that every option will be interpreted as a subject. It is in the identity between subject and option, option and subject, that *Impossible Probability* synthesizes the dialectical idea of the identity of object and subject, subject and object.

1.46. For example, intelligence is a psychobiological potential that is socially variable. That is, within the limits that biologically may determine a possible range of intelligence, the human being does not always develop his or her full potential. According to Vygotsky and Leontiev, one way of developing the full potential of intelligence is through programs of social cognitive development, mediation in learning. For this reason, social approaches defend the hypothesis that intelligence is a social variable, insofar as, within the possible biological conditioning of the potential of intelligence, that potential only transforms into *real intelligence* if there is an adequate social *development* of that intelligence. From the synthesis of theories of intelligence, a teacher who wishes to increase the potential of his or her students' intelligence will do so by transforming the Zone of Proximal Development, initially assessed, into real development. For this, in addition to administering an intelligence test before applying the program, at the end of the program the teacher administers a new test, varying some items to avoid correct answers by rote learning, but maintaining the level of difficulty of the questions.

1.47. When analyzing statistically the results obtained by a group of students after completing an intelligence program, traditionally, the First Method would first calculate the arithmetic mean of the raw scores obtained by each student on the test, and from there calculate the standard deviation based on the arithmetic mean.

1.48. In *Impossible Probability*, for absolutely every sample of subjects, the subjects will be treated as if they were options. For this reason, in *Impossible Probability* it will be said that there are two fundamental types of universes: universes of limited options (heads or tails in a coin, the six faces of a dice, political alternatives in democratic elections), and universes of infinite subjects or options—being universes of subjects or options because the subjects will be statistically studied as options.

1.49. In the example just presented, in which a teacher applies an intelligence program, the students will be studied as if they were options. For this purpose, one concept will be fundamental: the concept of **empirical probability**.

1.50. If the First Method uses probability only to study the distribution of frequencies among options, the Second Method will use probability for absolutely all types of studies involving a determined sample. This will be known as empirical probability, to differentiate it from the inverse of *N*, "1/N", which will be theoretical probability. Both will be used in universes of infinite subjects or options, as well as in universes of limited options.

1.51. If a teacher applies an intelligence test, and the results of the test for each student are the raw scores or frequencies of that student, the empirical probability of that student will be equal to the quotient of the raw score or frequency that student obtained on the test divided by the sum of all raw scores or frequencies. What in the Second Method is used as empirical probability is what is traditionally called relative frequency.

1.52. Now then, here arises the multifunctionality of the inverse of *N*. If in studies of options the inverse of *N* is the statistical term for equality of opportunities by chance, at the moment the empirical probability of each subject or option is calculated, the arithmetic mean of the empirical probabilities is the inverse of *N*. Therefore, the theoretical probability of occurrence by chance in equal opportunities will also be the arithmetic mean of the empirical probabilities. This will have important logical consequences in samples with zeros, as will be explained in this work. The inverse of *N* in *Impossible Probability* will acquire enormous diversity of functions, starting with being, for all types of universes of infinite subjects or options, and for limited options, both the arithmetic mean and the theoretical probability of occurrence by chance in equal opportunities:

$p(x_i) = x_i : \sum x_i$ = empirical probability

1/N = theoretical probability of occurrence in equal opportunities, and arithmetic mean

1.53. Now then, the teacher, in order to study how intelligence is a social variable that can be enhanced through learning socialization programs, once empirical probability is calculated, wishes to know the differential score between empirical probability and theoretical probability. In the Second Method, this will be called **Bias Level**:

Bias Level = $p(x_i) - 1/N$

1.54. Just as when tossing a coin several times, if there is greater bias in favor of heads or tails, it will be said that the coin is biased; or if there is less bias and the empirical probabilities tend to be identical to the inverse of *N*, it will be said that there is behavior of equal opportunities. In the same way, the teacher, through the study of the Bias Level, will be able to determine the type of behavior of the sample: whether the intelligence development program has produced development in equal opportunities—where proportionally all students tend toward the inverse of *N*—or whether it has produced a very positive effect only in those with greater positive bias, while not producing sufficient effect in the students with the greatest negative bias.

1.55. Although in section ten there is a more detailed description of this type of studies and of the way of transforming studies of subjects or options into studies limited to discrete categories—for example, to measure the increase in the frequency of students in discrete categories of higher intelligence—for now, in this introductory section, it is only necessary to clarify the fundamental concepts.

1.56. *Impossible Probability* is a mathematical model for the study of probability statistics, or statistical probability, which essentially redefines concepts from traditional statistics.

1.56.1. While in traditional mathematics, in the study of probabilities, *N* was the number of options, insofar as *Impossible Probability* transforms the study of subjects into options—where subject or option, option or subject, are studied in the same way—*N* will be interpreted as *N* options in universes limited to options, or as *N* subjects or options in universes of infinite subjects or options. As will be explained, this will include populations.

1.56.2. The redefinition of *N* as options (in universes of limited options) or subjects or options (in universes of infinite subjects or options) will imply a redefinition of the arithmetic mean. If in traditional statistics the arithmetic mean of raw scores or frequencies is equal to the product of raw scores by their frequency, divided by the total frequency, for traditional statistics *N* was equal to frequency. In the Second Method, however, *N* is equal to the number of subjects or options, such that the arithmetic mean can only be the inverse of *N*, with *N* being the *N* subjects or options in universes of infinite subjects or options, or the *N* options in universes of limited options.

1.56.3. At the moment when *N* is redefined, and the arithmetic mean is redefined, the concept of differential score must also be redefined, becoming the **Bias Level**.

1.56.4. Insofar as all these concepts are redefined, another concept will undergo an important redefinition in *Impossible Probability*: the concept of **Mean Deviation**.

1.56.4.1. While in the First Method the Standard Deviation will always carry more importance than the Mean Deviation, in the Second Method the opposite will occur: the Mean Deviation will be relevant.

1.56.4.2. Due to natural balance, all positive bias compensates for all negative bias. The sum of Bias Levels must therefore be unsigned, whether by absolute value in Mean Deviation, or by the root of the average of squared differentials in Standard Deviation. However, insofar as the Bias Level becomes an essential value, the Second Method will attempt to preserve as faithfully as possible the differential value resulting from the

differences between empirical probabilities and the inverse of *N*. To ensure that this essential differential value does not undergo any alteration, the Second Method will give priority to the Mean Deviation.

1.56.4.3. The importance of the Mean Deviation lies in that it will be equal to the product of multiplying the total bias by the inverse of *N*. The Total Bias is the sum of the absolute values of all Bias Levels. And insofar as the inverse of *N* is the theoretical probability of chance in equal opportunities, the Mean Deviation, as Total Bias divided by *N*, is the highest expression that the Mean Deviation is Total Bias by chance—or chance by Total Bias. In essence, the Mean Deviation is bias by chance (1/N), or chance (1/N) by bias: the order of the factors does not alter the product.

1.57. *Impossible Probability* will thus give new logical definitions to traditional mathematical concepts. As a product of these new definitions, new ways of understanding and mathematically explaining reality will emerge—within the margin of error, logical or moral incoherence, and moral responsibility before reality. The inverse of *N* will acquire increasingly more functions. For example, in universes of infinite subjects or options, the inverse of *N* will at the same time be the probability of sample representativeness error: insofar as the larger *N* is, the greater the representativeness, the larger *N* is, the smaller the error of sample representativeness. Therefore, the error of sample representativeness is inversely proportional to *N* in universes of infinite subjects or options. Likewise, in universes of infinite subjects or options, the inverse of *N* will be the probability of theoretical dispersion: insofar as the larger *N* is, the greater the tendency of the model toward zero and the smaller the dispersion. Dispersion is inversely proportional to *N*; therefore, the inverse of *N* is the probability of theoretical dispersion in universes of infinite subjects or options.

1.58. A fundamental concept in *Impossible Probability* will be the **dialectical identity of opposites**, because opposites will be identical within the margin of error one is willing to accept—the fundamental basis of all *Impossible Probability*.

1.59. The inverse of *N*, in universes of infinite subjects or options, will at the same time be central tendency, theoretical dispersion, and the probability of sample representativeness error.

1.60. In universes of limited options, the inverse of *N* is equally the theoretical probability of equal opportunities by chance and the arithmetic mean of empirical probabilities. And, as will be explained, as *N* tends toward two options, the inverse of *N* will be the greatest possible dispersion, for two-option models. And in universes limited to discrete categories, the inverse of *N* will be the probability of representativeness error of the discrete categories.

1.61. In universes of limited options, normally, the probability of theoretical dispersion and the probability of representativeness error of the sample of raw scores or frequencies will be the inverse of the raw scores or frequencies themselves: **"$1/\Sigma x_i$."**

1.62. A fundamental element that must be made absolutely clear before continuing with the work is to clearly distinguish what is a universe of infinite subjects or options, and what is a universe of limited options.

1.63. A universe of limited options is one in which the distribution of what happens is the distribution of frequencies among a limited number of options.

1.63.1. If I toss a coin into the air, the options are limited to heads or tails, even though the distribution can be infinite insofar as the coin is tossed infinitely many times. But the options are reduced to only two—heads or tails—accepting that by random causes, in exceptional tosses, it may be neither heads nor tails because the coin may stand upright on the edge of its circumference; in that case it would be neither heads nor tails, but only exceptionally.

1.63.2. If a study is made of the distribution of men and women in society, even though the distribution can be infinite insofar as the human population throughout all history may be infinite, the options in which this distribution can occur are limited to only two options: male or female, accepting that by genetic errors hermaphrodites may exist [after the transgender revolution we should include more genders, the book was published in 2011].

1.63.3. If we study the probability of a number coming up at random, from one to six, by tossing a six-sided dice into the air, the number of tosses can be infinite, but the frequency distribution can only be limited to six options.

1.63.4. If in democratic elections a determined number of candidates or delegates stand for election, the distribution of vote frequencies can be as broad as the number of voters with the right to vote. However, the frequency can only be distributed among that limited number of candidates or delegates who stand for election, although blank and null votes may exist, in addition to abstention.

1.63.5. In summary, by a universe limited to options we shall understand every statistical study of reality in which the distribution of frequency is studied among a limited number of options.

1.63.6. Universes limited to options can in turn be subdivided into two submodels: universes limited to options where *N* is materially or socially limited, and universes limited to options where *N* is variable.

1.63.7. If a coin only has heads or tails, if a human being can only be male or female, if a particle can only behave as wave or particle, if a dice has only six faces, if in a study the state of matter can only be: solid, liquid, or gaseous—these are materially limited options. Although by error it may occur that a coin stands upright on its edge, or hermaphroditic human beings may exist, these are exceptions or errors. Normally, if we toss a coin it will be heads or tails, every human being will be male or female. These are universes where *N* is materially limited.

1.63.8. There are also socially limited universes. Politically, a behavior can be defined socially as moral or immoral; civil status is socially defined as: single, married, separated, divorced, or widowed. Socially, a worker may be active or unemployed, and if active may be: salaried employee, self-employed, or employer.

1.63.9. A universe of options limited to a variable *N* is one where *N* can vary depending on the definition of *N*. Social classes may be subdivided into: lower, middle, or upper—a distribution into discrete categories that can be variable, since it could equally be: underclass, lower, lower-middle, middle, upper-middle, upper, very upper. Each discrete category is defined by a lower and upper limit of monthly income for that social class. In general, any study of discrete categories will always have a variable magnitude *N*. If we study the distribution of temperatures by establishing discrete categories, any subdivision of temperature into discrete categories—cold, mild, hot—will be one

possible subdivision among infinitely many, for example: extremely cold, cold, mild, hot, extremely hot, with each discrete category defined by lower and upper temperature limits.

1.63.10. If in elections *N* candidates or delegates stand for election, the magnitude *N* does not necessarily have to be the same. In different elections, a different number *N* of candidates or delegates may stand, such that the magnitude *N* may be variable

1.63.11. In any case, for every model of a universe of limited options—whether a universe of options limited materially or socially, or of options limited to a variable magnitude *N*—the inverse of *N* will be the arithmetic mean and theoretical probability of occurrence by chance, and the inverse of the raw scores or frequencies, $1/\Sigma x_i$, will be the probability of theoretical dispersion and the probability of sample representativeness error. Only in models of limited options that tend to be two options is the inverse of *N* the greatest possible dispersion. And only in universes of limited options reduced to discrete categories will the inverse of *N* also be the probability of representativeness error of the discrete categories.

1.64. By universe of subjects or options we shall understand every universe formed by *n*-th elements in which the raw score of some of their qualities is studied.

1.64.1. In an infinite history of the human species, infinite human beings could live. Any study of any human quality in a possible infinite human history will be the study of one possible selection, among all the infinite possible in the whole of human history. If a teacher wants to study the intelligence of his students, it will only be a sample of students among the infinite students who may exist throughout history. While in the study of male or female the options are limited to being male or female, however, if we study the quality of intelligence, the possible intelligence scores in an infinite history could be infinite. In an infinite history there may exist infinite people with different scores in qualities such as height, weight, or skill level for certain jobs or problems, or any other quality quantifiable as a raw score, in the individual measurement of each subject or option potentially part of a sample of individual qualities.

1.64.2. In an infinite universe there may exist infinite photons, electrons, neutrons, protons, quarks. Any selection of particles in the infinite is a selection among infinite

possible ones. If one wished to study a particular quality—the velocity of the particles under certain circumstances—one could obtain infinite raw scores, as many raw scores as measurements could be made of infinite particles, or even on the same sample of particles, infinite measurements between two different times.

1.64.3. In an infinite universe there may exist infinite stars with different masses, infinite stars with different proportions of helium and hydrogen, stars of different sizes, of different amounts of energy—all these qualities being measurable as raw scores of these qualities.

1.64.4. If one studies the temperature of any place, the number of measurements of raw temperature scores that could be made would be infinite. Not only if one had infinite time, extending infinitely the lower bound of time, or infinitely extending the upper bound of time—every period of time in itself is infinite. Between one point in space-time and any other there exist infinite instants, because the unit of time—the hour, minute, second, millisecond, nanosecond, or smaller than the nanosecond—any unit in itself is infinitely divisible. In a unit of time infinitely divisible, the possible measurements between two different moments could be infinite. Absolutely every space-time unit is the absolute unit of all its infinite instants.

1.64.5. The main quality of the universe of infinite subjects or options is that statistically one studies the magnitude of intensity of a quality. This magnitude of intensity will be called the **raw score**, and the empirical probability of the raw score of the magnitude of the quality will be equal to the quotient of the raw score divided by the sum of all raw scores.

1.64.6. Insofar as there may exist infinite human beings with infinite intensities of particular qualities, infinite subatomic particles with infinite intensities of particular qualities, infinite stars with infinite intensities of particular qualities—insofar as in a universe infinite subjects can exist treated as if they were objects—this type of universes will be known as universes of infinite subjects or options.

1.64.7. Now then, within universes of infinite subjects or options, only selected samples of the infinite subjects or options will be studied. Since logically human nature is limited—it does not know the infinite, only parts of reality, samples of what occurs—

then of the infinite it only knows a part of the infinite: the sample. And insofar as sample knowledge, it is partial. Therefore any illusion of absolute knowledge is mistaken. Modern reason knows nothing in an absolute sense; in a certain way it knows absolutely nothing—only parts of reality. Statistically, modern reason only knows samples.

1.64.8. If in a statistical study it is possible to integrate an entire population, any illusion that complete knowledge of the population equals absolute knowledge of the entire population is only an appearance. The human being cannot know reality in itself absolutely—only samples of reality, only what reality shows of the real: the phenomenon, the apparent form in which what exists is shown to reason and consciousness.

1.64.9. Population studies are equally sample studies, even if they do not appear to be so, because in essence every population is nothing more than a sample in the history of the behavior of a certain type of subjects or options.

1.64.10. Every population is in itself a sample among the infinite populations that may have existed in a particular history. Even if it does not possess an infinite history, insofar as history in itself is infinite—as infinite possible measurements between infinite instants—any measurement of a population at one instant is only a sample of the behavior of that population at one of its infinite instants. And insofar as any population study at one moment of history is the transformation of the population into a sample of history, the population is transformed into a sample for the study. Being the population a population-sample among the infinite populations of a possible history, then the statistical decision about a given population will be subject to the margin of sample representativeness error equal to the inverse of *N*, whenever the particular behavior of subjects or options is studied through their raw scores. In such case the inverse of *N* is the margin within which statistical decisions will be made, in addition to a critical reason being selectable as margin of error. For no knowledge can be absolutely true, when by definition the human being knows only in a limited way, what reality shows of itself—phenomena that show that something occurs, although we never know absolutely what occurs. We never know absolutely anything; of what occurs we only know a part, what politically it is of interest to know.

1.64.11. In universes of infinite subjects or options, including populations, always—and absolutely always—the inverse of *N* will be the arithmetic mean and the theoretical probability of occurrence in equal opportunities, and will also be the probability of theoretical dispersion and the probability of theoretical representativeness error, among other functions.

1.64.12. If we study the population of a tribe of indigenous people in the Amazon, the population is transformed into a sample for the study, a sample among the infinite different populations that this tribe may have had in history. As the tribe tends to decrease in inhabitants, it becomes less representative of the true behavior of the tribe in its history. As *N* tends to decrease, error tends to increase. If we study the population of whales in the oceans, the current population of whales in the oceans is only a sample of the true behavior of whales in history. But as the number *N* of whales tends to decrease, the representativeness error of the study increases in order to know the true behavior of whales in history.

1.64.13. Every magnitude in itself is infinite. Existence itself in time is transformed into infinity. Nothing can be known absolutely in time; only in time does the eternity of life transform into an empirical fact.

1.64.14. Studies in universes of infinite subjects or options will be characterized by studying samples of subjects or options selected from the possible infinity of subjects or options. Included within universes of infinite subjects or options are population studies.

1.64.15. Insofar as in infinity infinite measurements are possible, of a single population infinite measurements can be made between two different points in time. From a universe of infinite subjects as options, infinite measurements can be made of the infinite subjects or options. One way of systematizing the information is by studying the information in discrete categories.

1.64.16. Studies of discrete categories are explained in section ten. Their particular quality is to transform studies of infinite subjects or options—on raw scores or frequencies—into studies of options limited to discrete categories, transforming the sample of subjects or options into the total frequency in which the discrete categories

are distributed. The subjects or options are grouped among the discrete categories according to whether their raw scores fall within the limits of the discrete categories. Thus, the frequency of the discrete category is equal to the number of subjects or options that fall within its limits, and the empirical probability of the discrete category is equal to its particular frequency divided by the total frequency.

1.65. In summary, there exist two fundamental types of universes: universes of limited options (whether limited materially or socially, or of variable magnitude *N*), and universes of infinite subjects or options, which include populations. In studies of limited options, *N* will be the limited options; in universes of infinite subjects or options, or in populations, *N* will be the *N* subjects or options. Generically, when in studies of options, *N* = options, and in studies of subjects or options, *N* = subjects or options. Normally, when no distinction is made about the type of universe, whenever *N* subjects or options is mentioned without distinction, it will be understood to refer to any type of universe.

1.66. Insofar as universes of limited options study the distribution of frequency among options, and universes of subjects or options study the distribution of raw scores, then empirical probability in universes of options equals particular frequency divided by the total, while in universes of infinite subjects or options it is raw score divided by the total. Thus, in order to provide a definition valid for all types of universes, it will be said that empirical probability is the quotient of raw score or frequency of a subject or option divided by the sum of all raw scores or frequencies. In this way, the probability of theoretical dispersion and sample representativeness error, for the sample of raw scores or frequencies, in universes of limited options, is equal to the inverse of the raw scores or frequencies.

1.67. Although this introduction has only attempted to present fundamental concepts, it must be said that the entire foundation of *Impossible Probability* is dialectical theory, in which opposites will be identical—but within a logical, dialectical, and moral margin of error—in order to progress toward the most objective knowledge possible: the true isomorphism between idea and reality. This margin of error will be the one that scientific policy is willing to accept, whether of empirical skepticism or rational doubt, reflecting moral responsibility before the uncertainty of what happens.

1.68. The first logical identity upon which mathematical redefinition in *Impossible Probability* will be established is the identity between subject and option. By this identity, every subject can be statistically treated as an option, and every option as a subject. This logic is established so that in every sample of subjects, each subject is optional—insofar as each is a subject among infinite possible subjects, or a population among infinite possible populations. The identity subject/option will rest upon a margin of error: sample representativeness, the inverse of the sample, the inverse of *N* in universes of infinite subjects or options, or the inverse of the sample of raw scores or frequencies in universes of limited options. And upon this representativeness error, scientific policy accepts the sample itself, as the only way to know part of what happens.

1.69. By accepting the identity subject = option, the dialectical relation between subject or option, option or subject is being established. This is essentially the statistical expression of the dialectical definition of subject, by which every subject is transformed into object and object into subject. The dialectic of subject and option is the dialectic of object and subject; in essence all dialectic is the dialectic of being and not-being.

1.70. And by statistically treating the subject as option, and vice versa, the statistical identity between raw score and frequency is formalized, transforming relative frequency into empirical probability. The identity raw score or frequency, insofar as statistically raw scores are transformed into magnitudes of particular intensity to be divided by the total magnitude of intensities, in the same way that frequency as a magnitude of occurrence is divided by the magnitude of total occurrences. Thus, the identity subject/option is transformed into the identity between raw score or frequency, which will be identical as different expressions of magnitude: raw score of intensity, frequency of occurrence—both treated statistically in the same way, empirical probability, within the margin of sample representativeness error one is willing to accept, the inverse of the sample itself.

1.71. From the identity subject/option, and the identity raw score/frequency, the empirical probability of a subject or option is equal to its particular raw score or frequency divided by the total. From here arises rational critical study: in fact accepting

the error that is inherent in partially accepting reality, and within the margin of error that the ideal critical reason is willing to accept, the **critical probability**—in order to determine whether or not an idea is sufficiently rational to be identical to a real reality.

1.72. To accept reality partially implies accepting an error in fact. Every partial acceptance of reality is in fact an error. And upon this factual error is added the error derived from critical reason. The ideal critical reason will be the critical probability: in error studies, critical probability calculated upon an X percentage of error; in reliability studies, calculated upon an X percentage of reliability, such that one hundred minus percentage X of reliability equals the percentage of error in rational critique. Both kinds of error—the error in fact and the rational error—must be accepted by scientific policy.

1.73. Only that scientific policy which accepts the smallest margin of error in its scientific propositions will tend to be truly true, within the margin of error scientific policy is willing to accept. For in accepting an error, reliability is no longer absolute. Thus, every appearance of reliability in science is itself an ideology: the ideological idea of the reliability of science. For if reason cannot know absolutely anything except parts of the whole, no idea is absolutely reliable, only partially so. And in the process by which science replaces—within the dialectic of provisional ideas—the previous provisional truths, discarded because of their errors, with new provisional truths superior by having a smaller margin of error, the progress of science takes place. Science advances by substituting those ideas that were less reliable with new, more reliable ideas, reducing the margin of error and increasing reliability. In this way, the true ideology of science becomes scientific progress toward the ideal of reliability—the utopia, moral truth in itself.

1.74. The human being has no direct access to truth. He only knows what is shown: appearances and phenomena, events, from which he can logically deduce, critically and rationally, what happens. For truth is what is certain, and what is certain is that things occur. But the truth is that we do not really know what occurs, because of all that occurs we only know a part. And the part that we know, we call science. And even so, it is not absolutely reliable—it is only politically reliable. For only rational ideas are politically reliable, within the margin of factual or critical error that scientific policy is willing to accept.

1.75. What really happens is a mystery or problem that only intelligence can resolve.

2. The Origin of Impossible Probability

2.1. The chronological origin of Impossible Probability

2.1.1. In 1995, after finishing the University Orientation Course, I enrolled in Pedagogy at the Complutense University of Madrid. My free time I dedicated to writing poetry, dramas, and plays, although, like the rest of my work, they remain unpublished [till summer 2025].

2.1.2. In my fourth year of studies [Pedagogy], in the spring of 2001, I would begin to develop—still unpublished at that time—a theory of probability statistics, or statistical probability, which I would call *Impossible Probability*. I emphasized one of the postulates of this theory: given certain logical *conditions*, even the impossible in the infinite becomes inevitable.

2.1.3. I wrote those reflections in a critique of *contemporary* statistics where I set out the need for a new statistical theory adapted to nonlinear models, chaos theory, and dialectical logic.

2.1.4. My reflections on statistics *revolved* mainly around the need to overcome the model of hypothesis testing established on the null hypothesis.

2.1.5. The idea was to establish models of hypothesis testing where the critical value was zero. For this reason, in *Impossible Probability* zero or positive values are accepted in models of rational critique, as long as the factors are ordered for that purpose.

2.1.6. On September 11, 2001, I developed the first formula of all the equations that later came to compose this theory: the *Impact of the Defect*, which is also explained in this work.

2.1.7. At the beginning of my final year of university, the academic year 2001/02, I devoted myself fully to my studies and postponed the resumption of *Impossible Probability* for later.

2.1.8. I finished my degree in the summer of 2002.

2.1.9. From the autumn of 2002, I could finally dedicate myself entirely to *Impossible Probability*. At that time, my intention was to keep it unpublished. It was only a personal project, with no other aspiration.

2.1.10. On October 14, 2002, I began the first work in a series of mathematical writings in which I would eventually systematize *Impossible Probability*. I began writing *Intuition and Probability*. On October 16, 2002, I set out the concept of empirical probability and theoretical probability in the Second Method. At that time it was only a personal project, and in a certain sense something poetic and romantic, since even then I continued to write poetry and plays, though still unpublished [till now].

2.1.11. At the beginning of the winter of 2003 came *The Level of Similarity*, followed later by new mathematical works, especially *Assimilation and Integration*: a mathematical model for creating Artificial Intelligence, whose fundamental principles I will explain in the final sections of this work. If in the future I were to publish something from those works, I would introduce deep modifications, especially in *Integration*, adapting it to rational critique, possible variations, and the effect of *N* when integrating new variables into Artificial Intelligence.

2.1.12. During the year 2003, I devoted myself to developing *Impossible Probability*, in arithmetical and geometrical applications, not without a certain romanticism. In 2004 came my last mathematical writings of that phase. Even a year later, in 2005, although in an isolated manner, I still had the idea of writing an encyclopedia of *Impossible Probability*.

2.1.13. The works of *Impossible Probability* that I wrote between 2001 and 2004 can be said to form what would be the first phase in the development of this theory.

2.1.14. The second phase, much improved, I began on December 19, 2009, and it would be expressed in the printed work *Introduction to Impossible Probability, Statistics of Probability or Probabilistic Statistics*.

2.1.15. With the exception of 2005—when I had planned a kind of encyclopedia of *Impossible Probability*—between the summer of 2004 and December 19, 2009, I did not return to mathematics; the work remained unpublished.

2.1.16. In October 2009 I was diagnosed with hepatitis A. During the medical leave while the illness lasted, I once again enjoyed reading works of classical philosophy and science.

2.1.17. From the reflections during those readings, on December 19, 2009, I returned to *Impossible Probability* and to the need to make it known to the public. A few days later I began to plan the idea of publishing *Impossible Probability*, which is why I decided to write *Introduction to Impossible Probability, Statistics of Probability or Probabilistic Statistics*.

2.1.18. On January 6, 2010 I began writing the *Introduction to Impossible Probability*. On January 12 I began to work on what is *Validity*, and so on with all the other equations that form this work.

2.1.19. At the end of July 2011, when the print edition of the work was only a matter of months away, I began to explain *Impossible Probability* on the blog **probabilidadimposible.blogspot.com**. The print edition of *Introduction to Impossible Probability* came off the press on December 2, 2011. Since then, the diffusion of this theory has been slow but steady, and the printed work is available to readers in more and more universities, while more internet users visit the blog from which I began to disseminate this new way of understanding statistics and probability. It can be said that from the print edition a third phase of *Impossible Probability* began, in which it now finds itself—this being the third e-book edition (first in January 2013, second in January 2014) and the third print edition (first in 2011 and second in 2014)—which in the essentials of the theory remains faithful to the original edition. In this 2015 edition the treatment in absolute value of raw scores with negative sign is incorporated [the fourth phase is of Impossible Probability is the Global Artificial Intelligence].

2.2. The philosophical origin of Impossible Probability: dialectical logic, positivism, and critical rationalism

2.2.1. An important element of *Impossible Probability* is the need to ground science in the isomorphism between idea and reality. A fundamental problem in *Impossible Probability* is determining what the *idea* is.

2.2.2. The concept of *idea* is fundamental in *Impossible Probability*, and to understand the concept of idea in *Impossible Probability* it is necessary to understand the history of the idea in philosophy.

2.2.2.1. Plato will defend the hypothesis of the existence of permanent and immutable Ideas, of which physical reality is nothing but appearances. In Plato, the absolute or perfect Idea will be the Idea of the Good—goodness to be understood within Socratic moral intellectualism. The greatest possible goodness is in itself truth; moral truth is that which is true in and of itself, beyond all appearance. In the myth of the cave, knowledge is the light that refutes appearances. In Plato the hypothetico-deductive method is already present, insofar as hypotheses are established that one seeks to prove rationally true—but not empirically—upon dialectic, whose propaedeutic is mathematics.

2.2.2.2. Aristotle, in contrast to Plato's idealism, will defend empiricism, founded on hylomorphism—the unity of matter and form—knowledge being the way real objects are reflected in the *tabula rasa*, the *mind*, through the sensory pathways.

2.2.2.3. Descartes calls reason "*light*," and all knowledge can only be rational by doubting all previous knowledge. His scientific method is founded on identifying clear and distinct ideas, *analyzing* ideas, recomposing them—that is, elaborating the synthesis—and reviewing all previous steps, thus establishing rational truths.

2.2.2.4. Hume rejects the possibility of absolute knowledge, because all knowledge is a sensory product that generates habit, which does not guarantee the reliability of what is known. The very idea of cause itself must be the object of empirical *skepticism*.

2.2.2.5. Kant denies the possibility of knowing the absolute idea or *noumenon* of being-in-itself; one only knows being outside itself in the form of phenomenon. Knowledge is the *product* of critical reason as it criticizes being outside itself.

2.2.2.6. Hegel transforms the Absolute Idea into the upper *vertex* or keystone of all his philosophy, and the Absolute Idea is for itself the absolute unity or synthesis of being and non-being, because all knowledge of what being is implies knowing what it is not.

2.2.2.7. Positivism will reject the Absolute Idea, accusing it of being metaphysical. In contrast to the Absolute Idea, logical positivism proposes the logic of the hypothesis: the hypothesis is that particular idea of some aspect of reality formulated as a *linguistic* proposition which—besides internal linguistic coherence—can be verified by some criterion of empirical verification. Because the criterion of empirical verification led to inductivism, and because of the problems that contradictions between the main scientific currents of the time posed in the exact sciences, logical positivism eventually dissolved into secondary schools of thought, one of them being Popper's falsificationism.

2.2.2.8. Marx and Engels will assert that Hegel's Absolute Idea is a metaphysical or idealist ideology; that ultimately the idealist ideology of the Absolute Idea *aims* to defend the interests of the ruling classes—especially the bourgeoisie—and that, against the idealist ideology of capitalism, the alternative will be an ideology that politically defends the interests of the oppressed classes through the application of science to solve social problems.

2.2.3. *Impossible Probability*, as a philosophical synthesis, will take up aspects of the principal schools in the history of philosophy in order to define the idea.

2.2.4. In *Impossible Probability*, the idea is a mental representation of neuronal origin, the product of brain *physiology*, and insofar as it is a product of the brain, empirically physiological—subjective. Empirically, the idea is the product of the synthesis of information—whether of sensory origin or socially mediated—of a strictly phenomenological or ideological nature, the product of previous deductions or discoveries, which in synthesis will be information processed empirically and physiologically by the brain. Those pieces of information are logical premises for the production of ideas, of which only those that—being originally subjective—aim to be objective will be considered by science as empirical hypotheses, provided they are logical deductions from true premises, and only becoming provisionally objective depending on what critical reason decides. The way in which critical reason will criticize the rational sufficiency of an idea is by formalizing the idea into a linguistic proposition—hypothesis—which, besides having linguistic coherence, is an empirical hypothesis that can be demonstrated upon the empirical tendency of a sample, such

that if the sample is sufficiently representative and the tendency is sufficient in relation to a critical reason, then scientific policy will accept the empirical hypothesis, and the empirical hypothesis will become rationally and provisionally part of the model of scientific policy. The way in which scientific policy will establish the critical reason to show whether an idea tends sufficiently to be true will be in coherence with its own ideological policy; for this reason, every ideology implies a science, and every science implies an ideology.

2.2.5. The idea of reality and reality itself are identical because they are opposed within the accepted margin of error. Outside this margin of error, the idea is not identical to reality—therefore it would not be an isomorphic idea. An isomorphic idea is that idea identical to reality within the possible margin of error.

2.2.6. The origin of knowledge lies in direct sensory experience and social mediation. In any case, whether direct sensory experience or socially mediated, regardless of the initial origin, the sensory organs transform knowledge—whether direct or social—into electrochemical, physiological substances. Knowledge arrives from the outside to the brain through physiological processes; therefore, the ultimate origin of every cerebral cognitive process is *physiological*.

2.2.7. The empirical is empirical because it is physiological in nature.

2.2.8. The physiological is not reliable.

2.2.9. The empirical is not reliable.

2.2.10. It is an error to rely on that which lacks reliability.

2.2.11. Subjective reality, insofar as it is physiological, is not reliable because it is empirical in nature; therefore it is an error to rely on subjectivity, because only rational ideas are politically reliable—and only provisionally.

2.2.12. Only that which is provisionally objective is reliable. The objective is objective work—minimizing error and maximizing reliability—upon the object, to reach the scientific objectives of scientific policy, in space-time, in history.

2.2.13. Everything qualitative is transformed into quantitative.

2.2.14. A quantitative idea will be identical to a subjective reality within the accepted margin of error; outside this margin of error a quantitative idea will never be identical to a subjective reality.

2.2.15. A quantitative objective idea and a qualitative subjective reality will be identical because they are opposed within the accepted margin of error.

2.2.16. The margin of error is twofold. First, the margin of error determined by sample selection—the inverse of the sample selection, the sample representativeness error. Second, the margin of error relative to critical reason: every critical reason stated as a percentage of error is a margin of error stated as a percentage of error; every critical reason stated as a percentage of reliability will have as its margin of error the difference of one hundred minus the percentage of reliability. Even if critical reason accepts only zero percent error or one hundred percent reliability, the moral error of the moral judgment will depend on the probability of sample representativeness error. A statistical decision on a poorly representative sample will be morally less moral than a statistical decision on a more representative sample.

2.2.17. *Impossible Probability* is a dialectical theory insofar as it understands and explains the laws of dialectic: opposites are identical because they are opposed within the accepted margin of error.

2.2.18. *Impossible Probability* is positive because it is opposed to positivism. *Impossible Probability* and positivism are identical because they are opposed. They are opposed insofar as *Impossible Probability* arises from a theory of error that denies the neutrality of science. *Impossible Probability* and positivism are identical because they accept scientific propositions only on the basis of the truly positive and quantifiable fact—whether in the magnitude of intensity or of occurrence. Positivism defines science as the science of the positive fact, exempt from all ideological consideration; for dialectics, science and ideology are identical. Positivism and dialectical materialism both deny the metaphysical proposition by asserting that we can only rely on science, but the difference between positivism and dialectical materialism lies in the definition of the nature of scientific work: for positivism, science is exempt from ideology; for dialectics, scientific work is ideological work. Every science is an ideology,

and every ideology implies a way of doing science; science and ideology are identical within the accepted margin of error. Each scientific model will accept those ideologies that fall within the margin of error that that scientific model accepts; every scientific model will reject any ideology outside the margin of error it accepts. Separating the scientist from his ideology is impossible so long as science accepts margins of error.

2.2.19. *Impossible Probability* is critical rationalism because it is opposed to critical rationalism. Critical rationalism and *Impossible Probability* are opposed because for Kant the antinomy is insurmountable, whereas for *Impossible Probability*, as dialectic, the antinomy is overcome within dialectic itself. Critical rationalism and *Impossible Probability* are identical because both proceed from the need to criticize empirical information by criticizing the phenomenon, in order to access reliable information, since the empirical—that is, the phenomenon—cannot be reliable insofar as the empirical is purely phenomenal, appearance, physiology.

2.2.20. The principle of rationalism is that we cannot trust appearances. Plato's critique of appearances was the first form of critical rationalism in philosophy; Descartes' rational critique—through rational doubt—of sensory information was the second form of critical rationalism. Kant established the foundational bases of critical rationalism in a systematized way. Karl Popper would recover and extend Kant's ideas, but in a pessimistic way: if for Kant knowledge is Enlightenment optimism, for Popper knowledge is the frustration of the failure of Viennese positivism. For Popper, no knowledge is true; at most, all are falsehoods that we will take as scientific until we finally manage to demonstrate their falsehood. Thus, really nothing is true; everything is false—the difference being that there are falsehoods that have been shown false, and falsehoods we still have to show to be false. In any case, Popper is in a certain sense pessimistic, since we will never come to know any truth within the possible. My first mathematical work of 2001—my critique of contemporary statistics—was essentially a work critical of falsificationism. In contrast, already in the spring of 2001 I set out the need to overcome falsificationist pessimism. The founding of *Impossible Probability* in 2001 was the beginning of a long reflective process that has led me to the publication of this book. In *Impossible Probability* there are not only mathematical redefinitions; it also redefines dialectic and critical rationalism, and in essence *Impossible Probability*

redefines fundamental concepts of dialectical philosophy. For *Impossible Probability*, all opposites are identical because they are contraries—within the margin of error we are willing to accept. All contraries are identical because they are opposed—within the margin of error we are willing to accept—this acceptance being the acceptance of the ideological policy that guides scientific research. Guiding the ideological policy of science is also scientific work and is of course also ideological work. Science and ideology are identical because they are opposed; guiding the ideological policy of science is a task that is at once scientific and ideological.

2.2.21. Science insofar as it is transformed in turn into an ideology—science is, in turn, an appearance: the scientific appearance of reliability. The idea of scientific reliability is an ideology, that is, an appearance, a physiological product, an error accepted by the ideological policy of science. The essence of appearance is its ideology; the essence of ideology is to be an appearance. Appearance and ideology are identical because they are opposed: appearance is opposed to ideology insofar as appearance is the product of physiological subjectivity, and ideology implies an objective science. Appearance and ideology are identical because every ideology is an appearance, and every appearance is an ideological appearance.

2.2.22. The ideological appearance of reality is the appearance of reality.

2.2.23. Since the reliability of science is subordinated to ideology, it is self-consciousness that decides which model is more reliable for one's own interests. Human will is thus finally established in critical metacognition, which critiques its own physiological and rational processes, making for itself that proposition initially empirical and finally accepted as rational. The human rational essence is the self-conscious will of itself—the will that is conscious of itself for itself—freedom. Therefore, science, insofar as it is a dependent variable of freedom, is political. Science and politics once again become identical in self-consciousness, which is, in essence and ultimately at the highest level, will-in-itself, depending on moral, political, ideological freedom, which finally decides what is the true truth that is really truth according to its interests. Truth, insofar as it is not exempt from error—since it depends on the error one accepts—is a truth that will depend on the error accepted to reach the scientific-political objective. Every definition of truth is political: politically, true will be what it is

of interest to be true. When a truth, despite being truth, is not of interest to a given political model, then that truth—despite being truth—will be a truth rejected by that political model. A political model that rejects truth is an immoral political model. An immoral model of politics is, for example, those scientific models that in the Renaissance rejected Copernicus's theory without providing evidence, or those scientific models that even today reject Darwinism without providing evidence.

2.2.24. Every scientific acceptance of truth is a political acceptance. True scientific policy—morally ethical and logical—can only be that which is always willing to accept truth, within the smallest possible error, in the contrast to accept or reject a hypothesis depending on whether or not the hypothesis is, provisionally, true. This happens in the rational critique of the tendency shown by the empirical evidence, in order to reach a true, provisionally reliable idea of reality. The political ideology of scientific policy truly committed to truth can only be a true scientific ideology founded on the idea of reliability: the idea of reliable reality.

2.2.25. Ideology is the way of explaining and understanding reality according to social, economic, and political interests.

2.2.26. Critical intelligence is the ability to solve problems by accepting percentages of error. The very fact that intelligence is capable of recognizing the necessity of error percentages is an act of intelligence, in recognizing human limitation. Self-knowledge of oneself as a limited being subject to error makes necessary the recognition of possible error, through the acceptance of a margin of error, in which what is reliable is that the margin of error be as small as possible. Scientific work—that is, ideological work—is to minimize the *Impact of the Defect* while maximizing reliability, by controlling variables and accepting error percentages, in the planning of scientific (that is, ideological) actions in space-time, that is, in history, toward a scientific plan of history to reach the scientific (that is, ideological) objective: truth, within the error one is willing to accept. *Impossible Probability* is a critical rationalist theory insofar as it accepts margins of error, but it differs from Karl Popper's critical rationalism in that for Karl Popper what science aims to demonstrate is the falsity of the proposition, while *Impossible Probability* is limited solely to contrasting the isomorphic relation between reality and idea, demonstrating whether it is a true idea of reality.

2.2.27. Knowledge is provisional, but not because science must demonstrate the falsity of propositions. In *Impossible Probability*, the provisionality of knowledge is due to the fact that accepted margins of error transform, in sufficient or infinite time, into real errors.

2.2.28. Karl Popper explains the provisionality of knowledge on the basis that all knowledge is false *a priori*. Because if we still consider something true today, no matter how long it takes, in the end it will be refuted at the moment we have new evidence or new technologies. This produces a contradiction in science, since Newton's theory, Einstein's, the Big Bang, or Heisenberg's, are all false, even if they have not yet been completely refuted. They are only provisionally true. We only detect contradictions: between Newton and Einstein, Einstein and Heisenberg. Newton's theory is not fully applicable to general relativity nor to quantum physics in all its developments, nor relativity to the uncertainty principle, nor the Big Bang to relativism absolutely. For now, only incompatibilities have been demonstrated, and there are still phenomena that can be explained by these theories. For this reason, they are temporarily accepted as valid, though they are presumed false, and this will be demonstrated when appropriate evidence or technology becomes available. Popper begins from the aprioristic principle that all knowledge is false *a priori*. Yet demonstrating it is difficult, and during the interval of time until it is refuted, it will be considered provisionally true. Behind Popper's theory there is a certain pessimism, the product of the failure of Viennese positivism, since he presupposes that all science is false, pure appearance.

2.2.29. Because of this conviction that everything, in the end, is false—it is only a matter of time—in statistics contrasts are null hypothesis contrasts, in order to demonstrate that the empirical proposition is false. All null-hypothesis statistics are built on the theory that everything is false; we only have to prove it false. It is a matter of time until everything is demonstrably false. The null hypothesis contrast, in which it is intended to prove that everything is false, accepting something as valid temporarily until we succeed in proving it false, is, in every sense, a contrast where the scientist tries to show that the empirical hypothesis is false, striving in every way to accept the null hypothesis within the scientific procedure.

2.2.30. For *Impossible Probability*, science is science insofar as it is capable of producing isomorphic propositions. What *Impossible Probability* seeks to demonstrate is that idea and reality are identical within the margin of error that is accepted, and that if the idea lies within that margin of error, then the idea is identical to reality. In essence, *Impossible Probability* begins from the necessity of hylomorphism between matter and form, which is the basis of the isomorphism between idea and reality. For the idea is the essence of reality, since what we cannot rely on is reality in itself, because we do not know it completely. Every knowledge of reality is partial, a sample. All reality is apparent; of reality in itself we only know what it shows—phenomenon—upon which our brain constantly produces appearances, ideas that seem to be true but may not be. Only within a level of reliability inverse to the margin of error we are willing to accept can we reach a rational critique of that idea that seems true, to determine to what degree it is true—that is, to what degree it tends sufficiently to be reliable.

2.2.31. It is an error to rely on sensory appearances; every physiological product must be rationally criticized according to the margin of error we are willing to accept—the maximum possible reliability.

2.2.32. Only objective and rational *ideas* are reliable, within the margin of error of scientific policy, because knowledge of reality in itself is incomplete, sampled, not absolute, partial, therefore not impartial, therefore not neutral, it is ideological, it is *ideology*—in the struggle of *ideals* to become real.

2.2.33. The political-ideological objective of scientific policy will be to transform the moral ideal of truth into reality. The ideal is of ideal nature because it lacks the problems of reality. The resolution of the problem is resolved in substituting problematic reality for an ideal free of real problems. By making the ideal real, the universal problem then arises of how to put the ideal into practice—which is the problem of scientific work, that is, ideological work: the substitution of a problematic reality for a moral truth ideal. The problem then becomes the realization of the ideal, the *transformation* of reality into ideal and the ideal into reality. This is resolved in practice through scientific work, ideological work, where intelligence practically resolves problems ideally—in the identity of intelligence and work—where *intelligence becomes work and work becomes intelligence*, because intelligence and work are the same: activity, praxis.

2.2.34. What *Impossible Probability* contrasts is the level of concreteness of the truth-ideal in reality. The greater the level of concreteness of the ideal, the greater the level of scientific progress toward the political-ideological objective of knowing moral truth—so long as the political ideology is ethical in nature. The lower the level of concreteness of the ideal in reality, the lower the level of ethical commitment in the progress of ideas. The greater the level of ideal achievements in history, the greater the progress toward the ideal society or the ideal of humanity.

2.2.35. The ideal of reality determines the political-ideological objective of science: the scientific planning of actions upon space-time, history, in a programming of scientific objectives for the knowledge of truth. The *scientific plan of history* [the global plan in GAI is the synthesis of the global model plus global project, in essence the plan should be the Global Project System] must be a plan of historical objectives. The plan, as sequencing of actions, is a plan of sequencing objectives in history, to reach the ultimate objective of science: the *transformation* of problematic reality into a possible ideal.

2.2.36. Scientific work resolves the universal problem of the realization of the ideal through the acceptance of margins of error. This implies that the ideal established upon the acceptance of margins of error develops an ideal reality upon the margins of error that have been accepted, and that in sufficient or infinite time will imply that possible error becomes inevitable error. Every possible error will become real in sufficient or infinite time.

2.2.37. By transforming problematic reality into an ideal—through the acceptance of a margin of error—scientific work does not end, since it has only established the foundations of the new reality, which, being built upon margins of error, will be a reality that is ideal in principle but not absolutely ideal. The accepted error, once it becomes inevitable, will transform the ideal reality into a new problematic reality in the future, which will require new scientific work that will only be scientific if it reduces error—**minimizing the *Impact of the Defect* and maximizing the effectiveness and reliability of rational ideas** [third stage in the Global Modelling System as first step in the third state of GAI].

2.2.38. Scientific progress thus reveals itself in scientific work by progressively reducing the *Impact of the Defect* of accepted errors, progressively increasing the reliability of ideas, and progressively increasing the abstraction of the demands of scientific policy ideals, which, the more abstract they are, at the same time the more concrete.

2.2.39. Scientific progress is progress in the ideology of reliability. The greater the increase in reliability, the greater the scientific progress in isomorphic ideas and in ideal, ethical, logical demands. Reliability thus becomes the logic or ethics of ideology—a reliability that progresses by transcending its margins of error, being ***conscious*** of its own imperfection, insofar as it never reaches pure truth, always remaining at the level of phenomena, what reality shows of itself. Critically, **it progresses** within the margins of reliability of its statements, reducing margins of error and lessening the *Impact of the Defect*, thereby increasing its effectiveness and reliability. Yet insofar as reliability is never absolute, the idea of reliability is only an appearance of reliability—though an appearance of reliability highly probable, as science progresses in improving margins of reliability. But in any case, however probable its reliability may be, and even if it accepts only the smallest moral error in the truth of its statements, however small the error, it is sufficient for that proposition to be refuted at the moment of truth. For in science no proposition exists without some error, because science only offers us the sufficient appearance of reliability for us to continue accepting its statements, in the absence of a better idea that refutes them—in the progress of science toward an ever more reliable science, the *ideology of scientific progress*.

2.2.40. *Impossible Probability* is critical rationalism, because it establishes an acceptable percentage of error. This acceptable percentage of error is the basis on which a critical reason is calculated—directly or indirectly—and this critical reason is a rational number, a probability, which is a critical rational number insofar as it is the margin of error. The critical probability of *Impossible Probability* is the ideal critical reason of *Impossible Probability*. Critical probability will be the margin of reliability in reliability studies, where critical probability is calculated on an X percentage of reliability, with the difference of one hundred minus the percentage of reliability equal to the percentage of error within which scientific policy makes the statistical decision.

In error studies, critical probability will be the margin of error, calculated directly on the X percentage of error, within which scientific policy makes the statistical decision.

2.2.41. Insofar as what *Impossible Probability* contrasts are ideas—since we can only rely on ideas within the margin of error, since only these ideas are isomorphic within the margin of error—what is done is an ideological contrast, because every idea is itself an ideology, because every concept is a conception of reality, and every decision in the ideological contrast of ideas produced by critical reason is a political decision. Every scientific decision is a decision of scientific policy.

2.2.42. *Impossible Probability* contrasts ideas, whereas Popper seeks to demonstrate the falsity of ideas. The difference between Popper and *Impossible Probability* is that for Popper everything is false *a priori*, whereas for *Impossible Probability* what matters is the reliability of rational, quantitative, objective ideas. For the positive fact in itself is the idea of fact, within the very factual error that is knowing and accepting partially the reality in itself. What is determined is the level of reliability of that idea, reason, or positive fact—whether that idea is highly reliable or not reliable. For if an idea is not reliable, because it lies outside our margin of error, then we cannot rely on that idea, since we can only rely on those ideas that are highly reliable in the *light* of critical reason. And to determine which idea is more reliable than another, the ideal critical reason is determined—critical probability—whether margin of error or margin of reliability.

2.2.43. Reliability is a dialectical necessity. It is necessary to elaborate reliable ideas—in other words, it is necessary to elaborate a reliable science. But elaborating a reliable science implies elaborating a seemingly reliable science, because insofar as we accept a margin of error, that idea of reliability is simply an appearance of reliability, inversely proportional to the margin of error. The only possible solution is to increase reliability by reducing possible error, to make ideas progress toward logic [in essence, the aim of GAI is to eliminate error].

2.2.44. For *Impossible Probability*, knowledge is provisional to the same extent that the appearance of scientific reliability is a scientific ideology. For we can only rely on science within the margin of error that is accepted; we only rely on what lies within that

margin of error. Outside that margin of error absolutely nothing is reliable, and even within that margin of error one cannot say that everything is absolutely reliable, because in accepting a margin of error, reliability can never be absolute insofar as there is error. A science that accepts an error will never be an absolutely reliable science. There will only be a probability of reliability inversely proportional to the probability of error. Therefore absolute reliability is a myth: science is never absolutely reliable. ***To accept a possible error is to accept an error***. In sufficient or infinite time, it is an error to accept a possible error.

2.2.45. The reliability of science is a scientific ideology, in which each ideology seeks to show itself as the most reliable. But ultimately, ultimate reliability will depend on the critical self-consciousness of ideology. That is, ultimately, the moral critique of science and the scientific critique of morality will determine what is the true science that should be accepted, in the scientific struggle to be the paradigm of science. The moral critique of science and the scientific critique of morality should be the criterion humanity follows universally. Error and decision are identical because they are opposed.

2.2.46. The fact that margins of error are accepted means recognizing human limitation, because the human being, as a limited being, cannot know the absolute. He can only access partial knowledge: the sample. Therefore, it is not impartial knowledge, and thus it is knowledge that cannot be neutral. It can only be ideological. For every science is an ideology, every science creates the appearance of reliability, every science calls itself science insofar as it calls itself reliable—but it is only reliable in appearance, because all science accepts margins of error. Because the human being, as limited, can only work with margins of error. **The human being is incomplete because he lacks complete absolute reliability**.

2.2.47. Reliability is the scientific ideology because reliability is necessary. The human being needs to rely on something or someone, because it is inherent to human *condition*, human subjectivity to need to trust something or someone in order to live, to solve the problem of life. Intelligence creates objectively reliable elements for work.

2.2.48. The origin of objectivity is subjective necessity—the need to rely on something minimally reliable. The origin of objective reliability lies in subjective necessity itself, in

reliability, because the human being is aware that he cannot rely on himself insofar as he is subjective, since the subjective is prone to *error*. Subjectivism is *physiological*, and to overcome subjective error, consciousness creates critical reason, to generate reliable postulates under the appearance of reliable scientific propositions. The rational appearance of science is the reliability that human subjectivity needs. The rational reliability of science is a subjective reliability insofar as it is determined by the scientific subject. The scientist determines the margin of error he deems necessary to create reliable science. The natural tendency of human *evolution* is the tendency to create elements of social and scientific reliability. The incomplete knowledge of absolute reality itself is the reason why the human being cannot rely on a reality that he does not know completely, giving rise to empirical skepticism or rational doubt, the genesis of critical reason. The difference between science and metaphysics is that metaphysics makes subjectively reliable propositions about unfounded beliefs without empirical or rational demonstration. Science generates reliable propositions on the basis of critical reason, which conscious awareness creates in order to rationally doubt the reliability of qualitative propositions, to identify the truly reliable ideas on which to rely. *Consciousness* is aware that *mathematically* reliable ideas are quantitative, objective ideas. Thus qualitative consciousness is transformed into quantitative reason—critical reason—and in turn qualitative moral critique into quantitative moral critique. For example, it is not enough to say that capitalism is bad; one must demonstrate it mathematically: mathematically contrasting the accumulation of wealth by a minority against the vast majority who suffer misery. That must be the reliable critique: scientific critique. And from the mathematical-moral critique—or moral mathematics—to the critical establishment of the ideal in social terms: social progress through the application of science and technology to the resolution of social problems.

2.2.49. Subjectively, the origin of the dialectical need for reliability lies in the very limited human condition, because the limited human nature—by generating error in the contradiction between the finite human being and infinite reality—recognizes itself as an incomplete or inconsistent being, that is, incomplete or incoherent, that is, subjective, as opposed to the reliable and rational idea of being intelligent.

2.2.50. The being-in-itself, limited—outside itself in a moral struggle for survival—will make itself absolute through work; in its higher form, intellectual work; and within intellectual work, *purely logical work* [pure operations]: scientific work. The first division of labor was sexual; the second division of labor was intellectual [the third I would say it is artificial, AI]. Through science the human being is capable of controlling natural phenomena to guarantee survival, and ultimately, to guarantee survival one needs reliability—one needs to rely on that which can guarantee survival: science, critical reason.

2.2.51. Now then, a being-in-itself that is limited—where the origin of its subjective errors is the contradiction between its limited nature-in-itself and the infinite nature outside itself—when it produces science for itself, cannot produce absolutely reliable ideas. For an incomplete or inconsistent being—that is, incomplete or incoherent—by accepting a margin of logical or moral incoherence, cannot produce absolutely reliable ideas, because by being in itself incoherent or incomplete, it can only produce objectively provisional ideas. And it is from the incomprehension of provisional knowledge that absolute ideas arise.

2.2.52. If for Karl Popper the provisionality of knowledge is due to every idea being *a priori* false, for *Impossible Probability* the provisionality of knowledge lies in the accepted error itself.

2.2.53. An idea accepted with a margin of error is a possible error. Every acceptance of a possible error implies that this possible error becomes an inevitable error in sufficient or infinite time.

2.2.54. An idea rationally accepted with a margin of possible error—when the possible error becomes inevitable—the rational idea becomes a false idea. For if the reliability of the idea lay within the accepted error, as soon as that error we accepted becomes an inevitable error in sufficient or infinite time, then that accepted possible error becomes a real error, and accepting error is, in the end, an error.

2.2.55. The human being needs reliability; therefore, he generates a morally necessary minimum possible margin of error. But once the morally necessary minimum possible error becomes truly inevitable, then it is shown that accepting an error is itself an error.

To accept a possible error now implies accepting an inevitable error in sufficient or infinite time.

2.2.56. When the possible error becomes real, then the idea is rejected for being the direct cause of error.

2.2.57. When the error occurs, the idea is rejected, and in the face of the error produced, new ideas are produced scientifically—based on the study of the errors and of the possible alternatives to solve the problems that gave rise to those errors. Intelligence is the capacity to solve problems; when an error occurs, there is a problem that demands resolution. Preventing and correcting errors is an act of human intelligence.

2.2.58. Although my intention is not to anticipate ideas that will be developed in the following pages of this book, the scientific schema of *Impossible Probability* is as follows.

2.2.58.1. Science is subdivided into two types of sciences: the analytical sciences and the synthetic sciences.

2.2.58.2. The analytical sciences—those that are not based on phenomena or positive facts, the empirical data that reality shows—are fundamentally logic, mathematics, and linguistics or philologies insofar as their object is formal analysis, the establishment of formal relations.

2.2.58.2.1. The method of the analytical sciences is the deductive method, since a science that is not positive can only be deductive.

2.2.28.2.2. The syllogism of tendency is the analytical method that, in statistics of probability or probabilistic statistics—insofar as it is an analytical science in itself by being mathematics—*Impossible Probability* develops in the logical analysis of tendency.

2.2.58.3. The synthetic sciences are the sciences based on phenomena or positive facts, the empirical data that reality shows; within the synthetic sciences are included the natural and the social sciences.

2.2.58.3.1. The method of the synthetic sciences, whether social or natural, is traditionally called the hypothetico-deductive method, from which hypotheses are deduced and put to the test to accept them. In *Impossible Probability* the testing of empirical hypotheses is carried out by means of the rational critique of what happens, such that if it is zero or positive, at the individual and sample level, on sufficiently representative samples, and with a morally demanding critical reason, they are provisionally accepted as universals.

2.2.58.3.2. The hypothetico-deductive method produces empirical hypotheses from logical syllogisms deduced from empirical propositions. Critical reason then critiques the empirical hypothesis on a margin of error or reliability, on sufficiently representative samples, both at the individual and sample level. If the hypothesis is equal to or less than the margin of error, or equal to or greater than the margin of reliability, the empirical hypothesis is accepted for being rationally sufficient. And the accepted empirical hypothesis will be accepted provisionally as long as its accepted error—whether critical error or sample representativeness error—does not become inevitable. For this reason there always exists sufficient reason to doubt the empirical hypothesis; the magnitude of rational doubt will be proportional to the margins of error accepted. A hypothesis or set of empirically accepted hypotheses forms a theory; and a theory or set of theories forms a scientific *model* [second stage in the Modelling System, as the first step in the third stage of GAI]; and a model or set of models a scientific paradigm. A model is a precedent or antecedent—in any case an accident of history. Different models of scientific policy struggle among themselves to be the paradigm of a particular empirical science, or of science in general. In the scientific struggle to be the paradigm of a science—or of Science—there are *moments* (for example, in the Middle Ages during the Inquisition, or in the Second World War) in which it is possible that ***the scientist must give his life for the model***. The fact that the scientist gives his life for a model does not legitimize the model; it only indicates the ***degree of the scientist's commitment to the model*** [in my my case, my degree of commitment to Mother, Gaia]. ***What truly legitimizes the model is the level of isomorphism*** [in my case, all the evidence]. That scientific model which triumphs in the scientific struggle becomes the paradigm of a science or of Science. The change from one paradigm to another in

science is a ***paradigmatic revolution which socially becomes potential social revolutions*** [in GAI, Artificial Intelligence Revolution]. And the new paradigm will be the paradigm of a science or of Science as long as no superior paradigm arises, or until the errors accepted by that paradigm become inevitable. Then there would be a new paradigmatic crisis, giving rise to new scientific struggles which are, in essence, true ideological struggles.

2.2.58.4.. Mathematics, although on the analytical plane it can be considered absolute—*two plus two is four* now and always, absolutely, universally, and irrefutably—the truth is that once one accepts that mathematics is incomplete or inconsistent, the absolute value of mathematical analysis is relative. On the other hand, mathematics is not a positive science; like logic, it is an analytical science. Its object is not to know phenomena or positive facts because it is not synthetic; for in reality mathematics is a language—the language of the synthetic or positive sciences—a system for encoding information and ways of relating and processing information, just as, by analogy, a spoken language encodes information to relate and process it in a certain way. And just as a philology or linguistics studies a given spoken language, mathematics—at the same time that it is the language of the synthetic or positive sciences—is also the study of the language of the synthetic or positive sciences. Thus a given formal relation in a given language—mathematics—the analytical proposition "*two plus two is four*," is an absolutely true formal relation only and exclusively for that language, and not for any other language different from that language. And at the moment a formal relation is synthesized to positive or empirical data—the synthetic proposition—there is a margin of error or uncertainty, a margin of incommensurability between reality-in-itself and the language used to express that reality, a margin of logical nihilism, wherein not every synthetic proposition is necessarily true, despite the synthetic proposition synthesizing a mathematico-formal relation to positive or empirical data. Analytical mathematical propositions may seem universal; however, in reality they may be inconsistent or incomplete. The only certain thing is that a pure analytical-mathematical proposition—for example, that *two plus two is four*—will be true only within, and only for, that language: mathematics. Because the moment empirical data are synthesized to formal relations, it will be provisional and relative

within a margin of uncertainty in which possibly nothing is certain. Propositional or hypothetical provisionality acquires its maximum relevance on the synthetic plane of science, where no maxim is either universal or absolute. Science must accept a margin of error inherent to its synthetic propositions. That mathematical margin of error implies accepting that empirical truth is not logically absolute nor absolutely moral, which implies accepting mathematical progress in the knowledge of truth—objective reality, reality-in-itself. We do not know what science will be like in hundreds or thousands or millions of years—centuries or millennia. The only thing we know is that scientific, paradigmatic, or ***technological revolutions*** tend to follow one another more rapidly. We do not know into what kind of science humankind will evolve in a state of permanent revolution, provided humanity exists.

2.2.58.5. The relation between the analytical sciences and the synthetic sciences, in the overall development of science—as a set of postulates, procedures, and propositions on which to base scientific, technological, and social progress—is dialectical. Within the synthetic sciences, the function of the analytical sciences is to guarantee the logical and linguistic coherence of empirical hypotheses: that the linguistic structure on which the empirical hypothesis is formed be logical and coherent; that the process in forming empirical hypotheses—from empirical premises to logical conclusions, the empirical hypotheses to be rationally criticized—be logical; and that the mathematical models of rational critique used to test the empirical hypothesis be logical and coherent models of rational critique.

2.2.58.6. Insofar as the relation between analytical (logico-formal) sciences and synthetic (phenomenological or positive) sciences is dialectical—identical insofar as they are opposed—any paradigmatic change, however insignificant, in an analytical science can mean a paradigm shift in all science in general, including both analytical and synthetic sciences; likewise, any change in the paradigm of a synthetic science, whether social or natural, can be a sufficient principle for a paradigm shift in all science in general, both analytical and synthetic.

2.2.58.7. Throughout the history of philosophy and science there have been situations in which, for example, a change in mathematics or in the paradigm of linguistic analysis has entailed a paradigmatic change in all the sciences; or a change in a particular

empirical science—for example, physics, biology, or sociology—entails a paradigm change across all science.

2.2.58.8. In the particular case of the synthetic sciences, at the moment when, in the scientific struggle to establish the paradigm of a particular science—natural or social—this affects all the other sciences, it can entail the establishment of a new universal paradigm across all the sciences, analytical and synthetic; thus a universal change in the paradigm of science.

2.2.59. *Impossible Probability* is scientific insofar as it follows the deductive method in the formulation of mathematical propositions, premises, statistics, and *models* of rational critique in the development of probability statistics (statistical probability), applying the **syllogism of tendency**, summarized as: if A tends to be B, and B tends to be C, then A tends to be C. Every identity is a relation of identity within the accepted margin of error. This analytical method is how models of rational critique of empirical hypotheses are developed according to the critical reason.

2.2.60. Everything within the margin of error is accepted.

2.2.61. Everything outside the margin of error is rejected.

2.2.62. *Impossible Probability* is identical to positivism and to critical rationalism within the accepted margin of error; outside that margin of error, positivism denies the relation of identity between science and ideology, and outside that margin of error, critical rationalism denies the antinomic overcoming between noumenon and phenomenon.

2.2.63. For *Impossible Probability*, all science is ideological, and every ideology implies a way of doing science.

2.2.64. Scientific synthesis produces identities; *artistically*, it creates identities. Producing and creating are identical because they are opposed. *Science and art* are identical because they are opposed: scientific production entails creativity; artistic creation entails technical and technological production of art. All art has a scientific foundation in the technical and technological production of art; all science has an artistic foundation in scientific creativity itself. To produce is to create, and to create is to produce.

2.2.65. Freedom and equality will only be possible within the margin of uncertainty we are willing to accept in social progress as science and technology advance exponentially; for this, science and technology must be placed at the service of solving social problems.

2.2.66. The analytical method of *Impossible Probability* is the syllogism of tendency. Insofar as it is a logical syllogism, it is logic; and insofar as it is a dialectical syllogism between premises and conclusion, it is dialectic. *Impossible Probability* is a result of the logical application of dialectic to mathematics. Knowledge, as knowledge, is provisional; what is universal is logic—which evidently implies a dialectical contradiction.

2.2.67. In the very dialectic of science, the scientific method is universal; and yet from a universal method only provisional knowledge is deduced. The fact that a universal method generates provisional knowledge does not invalidate the method; it only demonstrates the dialectical contradiction of how a universal scientific method can only obtain provisional scientific knowledge—a dialectical contradiction that has its origin in the very origin of error, because a finite human being cannot know the infinite. It is in the contradiction between finite human nature [*condition*] and infinite reality [*context*] where the provisionality of knowledge resides—in the slow *progress* [*sybthesis, praxis*] from appearances to the ideal of critical reason.

2.2.68. A limited, non-infinite being cannot completely know the infinitude of qualities and singular particulars of the universe; and from the absence of absolutely complete comprehension or explanation arises mathematical incompleteness. Provisional knowledge will be inconsistent within a margin or percentage of logical or moral incoherence—margin of error—before real reality, before the necessary acceptance of properly human incoherence: the dialectical contradiction of being vis-à-vis what it is not, infinite being.

2.2.69. The human being, in his biological limitation, is only capable of generating universal methods to access partial knowledge. Perhaps the most important method of science, throughout the history of philosophy from Socrates and Plato to Hegel, is the syllogism. The way *Impossible Probability* applies the syllogism is through the

dialectical identity of opposites, accepting a margin of contradictions in science, wherein the first possible identity is the identity of subject and option—product of the dialectic of subject and object—to evolve toward the identity of idea and material reality, or matter and idea, where finally—within the margin of error we are willing to accept—matter and idea will be identical insofar as they are opposed, within a margin of empirical uncertainty or rational doubt within which a singular identity is validated to accept a particular truth of the universe. Although truth can never be *guaranteed* absolutely, only within a reliable margin inverse to the margin of error that scientific policy accepts. To know truth—the truth and only the truth—is the true moral object of knowledge within a logically acceptable margin of logical or moral incoherence, as scientific acceptance of the human condition itself—partly, or within a margin—subjective and physiological. Therefore truth can never be absolute; at most relative or provisional. Every truth entails a margin of uncertainty about what truth really is. Accepting human error in every scientific decision means accepting the human condition itself—partly or within a margin—subjective and physiological. In scientific theory, accepting scientific error is accepting that humanity is a product of chance in natural history, from which human history is deduced.

2.2.70. The human being by nature is a subject biologically the object of evolution, and historically of progress toward the ideals of history; and insofar as evolutionary process or historical progress, is not an end in itself—not a finished or completed entity. Humanity must be the beginning of everything; in fact, true humanity is still to be realized.

2.2.71. Any definition of human nature must begin from the conditions of possibility of the definition itself.

2.2.71.1. The most apparently immediate condition of possibility that makes any definition possible is the cognitive capacity to identify objects by means of concepts [by Application, deep comprehension], the rational capacity to identify objects by means of ideas—the capacity that permits the identity of idea and reality, matter and form, subject and object, object and concept; being a capacity of thought, the "I think." [The link]. But an "I think" that does not necessarily imply an absolute "therefore I exist," because given that every truth is relative within a margin of uncertainty, the quality of

existence cannot be assured or guaranteed with absolute reliability—only provisionally. Science cannot demonstrate the absolute existence of anything; at most provisionally. Absolute certainties do not exist—not even the certainty of "I exist" is absolute. Science cannot guarantee anything absolutely, because it is possible that absolutely everything is pure sensory appearance—phenomena.

2.2.71.2. And upon that premise—which does not entail absolute guarantees of existence—"I think," as an indispensable condition for defining reality, the other premises or logical conclusions are deduced. For example, that the capacity for thought emanates from the internalization of language, insofar as thought is internalized language; and every language, in its origin as a tool of social communication, presupposes the existence of a social group from which the very capacity to think emanates—a social group as synthesis of the needs of the objective, material conditions of existence. Therefore, if material and social reality precede reason, it is only possible to define human nature as social and rational nature, insofar as the human social condition is the premise of rational capacity; and since rational capacity itself is that capacity by which humanity, through science, attempts to give a logical definition to reality—within the margin of physiological and subjective error presupposed by its own material form of being, without which its own physical existence would not be possible.

2.2.72. For *Impossible Probability*, idealism and dialectical materialism will be identical—within the margin of error we are willing to accept—in the progress toward a sufficiently reliable science [the permanent revolution of science].

3. Concept of Probability

3.1. Concept of number

3.1.1. From Hegel's work one can deduce the dialectical law that everything quantitative is transformed into qualitative and vice versa.

3.1.2. Empirically, number is the quantitative *content* of the qualitative. Every quality can be quantitatively expressed in numerical form, and that numerical form is obtained from the measurement and weighting of its qualitative dimensions.

3.1.3. Number, insofar as it is the content of qualitative dimensions, is applicable to the mathematical proposition.

3.1.4. Every mathematical proposition—that is, every mathematical formula—inasmuch as it is a formula, that is, a proposition, is formal; and insofar as it is mere form—that is, a mere formula—it is devoid of content. The formula is mere form without content.

3.1.5. The number obtained from the measurement of the qualitative is applicable to the mathematical formulation—that is, to the mathematical proposition—thus making number the content of the formal mathematical formula. Number is the content of the mathematical form.

3.1.6. Any mathematical proposition (formula, form) will yield different results insofar as it is developed with different numbers. The content of the formula will determine the result of the formula.

3.1.7. The basis of number is the unit.

3.2. Types of numbers

3.2.1. Prime numbers: numbers are formed from the addition of units; the unit is the first prime number, and the number two is the only even prime number; a prime number is divisible only by itself and by the unit.

3.2.2. Natural numbers: any positive number from the unit onward; they are formed from prime numbers—the addition of prime numbers forms the natural numbers.

3.2.3. Integers: any number from minus infinity to infinity, including zero. Integers are formed both by addition and by subtraction of numbers. If in a subtraction the first number is less than the second, then the result will be an integer with a negative sign. Subtracting the same number from itself equals zero. Integers range from minus infinity to infinity.

3.2.4. Rational number: every number expressible as a quotient; it is usually written as a fraction or as an integer followed by decimals. The decimals are written after a separator following the integer part, which is then followed by the decimals. Rational

numbers are formed by the quotient of two numbers, where the first factor is divided by the second factor. They are called *rational* because they arise from a *ratio*; every quotient is also called a *ratio*, and the result of a ratio is a rational number.

3.2.5. Irrational numbers: numbers whose logic we do not understand—for example, the number π, the square root of minus one, the square root of two. In fact, in a certain sense, that there is only one even prime number—the two—is something irrational in itself.

3.3. Concept of probability

3.3.1. Probability is the study of what happens.

3.3.2. An event is any accident or contingency that occurs as a phenomenon transformed into an object of study.

3.3.3. The subjective is identical to the objective within the accepted margin of error, to the same extent that object and subject will be identical within the margin of error accepted; the identity of object and subject is the identity between the objective quantitative idea and the subjective qualitative reality.

3.3.4. Reality is formed by chains of contingent accidentalities, or contingent accidents—in any case, reality is formed by causal or multicausal chains. Chance, which can be studied through stochastic studies, is the focus of probability: the stochastic study of the incidence of chance and bias in apparent reality, in order to reach true knowledge—a clear and distinct idea of which idea tends to be truer, isomorphic, within the accepted margin of error. Even if in a reliability study critical reason were to accept only 100% reliability, the fact of being a reliability study on a given sample means that the moral *judgment* issued by scientific policy in the statistical decision will always be subject to the probability of sample representativeness error, equal to the inverse of the sample. Every scientific-political decision entails a margin of error: the first margin of error is that accepted in the sample selection itself; the second margin of error is that of critical reason itself. Even if critical reason were to accept zero percent error (therefore one hundred percent reliability), always—and absolutely always—even a statistical decision on a zero percent error in critical reason (one

hundred percent reliability in critical reason) will be subject to the margin of error corresponding to the inverse of the sample: the inverse of *N* in universes of infinite subjects or options; the inverse of the raw scores or frequencies in universes of limited options.

3.3.5. Since every idea is true within a margin of error, an absolutely true idea is impossible so long as a margin of error is accepted. The degree of isomorphism of the idea will be inversely proportional to the margin of error accepted; reliability is inversely proportional to the margin of error. Thus reliability will determine the degree of isomorphism of the idea—namely, the degree of isomorphism between idea and reality.

3.3.6. Insofar as reality is formed by causal, multicausal, correlational, random, stochastic chains—in the dialectic of accident and contingency, in the dialectic of chance that produces bias and bias that produces chance—probability is the study of what happens.

3.3.7. *Natural law is the law of probability*, and the law of probability is the law of chance; therefore, *natural law is the law of chance*. Natural events are random events that by chance cause effects that by chance cause causes that by chance cause effects... and so on *ad infinitum in infinite natural history*. As will be seen in later sections, in *Impossible Probability* two substantial forms of chance are distinguished: theoretical chance—whose role is played by the inverse of *N*—and empirical chance, which is expressed by the empirical normal sample dispersion itself. The Mean Deviation is the distribution of Total Bias by chance. The Mean Deviation is, in essence, bias-by-chance or chance-by-bias—the order of the factors does not alter the product; in any case the Mean Deviation is bias and chance.

3.3.8. The study of what happens is carried out by constructing samples of events or propositions of the same conceptual category—the essential idea of the empirical hypothesis—and, based on the tendency of the sample, demonstrating the tendency of the idea (the empirical hypothesis) to be true. The empirical nature of the hypothesis is due to the fact that ***every hypothesis is materially the product of the brain's electrochemical reactions***. Every material product of the brain must necessarily be empirical in nature; everything empirical must necessarily be rationally criticized. The

brain's material products are not reliable in themselves; only those material products of the brain in the form of empirical hypothetical ideas that are rationally accepted as provisional are reliable—thus becoming part of objective reality: science.

3.3.9. In universes of infinite subjects or options, the greater the number of sample events or propositions, the greater the reliability of the sample; and the smaller the number of propositions or events, the lower the reliability.

3.3.10. The inverse of the number of subjects or options will determine the probability of sample representativeness error in universes of infinite subjects or options, where population studies are included (as explained earlier), and under certain circumstances, determined by scientific policy, studies of discrete categories as well. Events or propositions are the subjects or options. Every subject or option is itself a real event or a categorical proposition. To say subject or option implies saying subject or conceptual *category* [what makes possible the transformation of categories into factors and factors into categories]—a real reality or a conceptual definition; subject or category, category or subject, subject or option, option or subject, subject or object, object or subject. In universes of limited options, the probability of sample representativeness error will be equal to the inverse of the raw scores or frequencies, since the raw scores or frequencies are the occurrences that form the sample.

3.3.10.1. Error and Reliability in a sample of N subjects or options belonging to universes of infinite subjects or options

3.3.10.1.1. The number of subjects or options in a sample, in universes of infinite subjects or options, is *N*. That is, the number of subjects or options *N* forms the sample *N* in universes of infinite subjects or options. A universe of infinite subjects or options can be the universe of stars in our universe, or the universe of planets or asteroids in our universe; in an infinite history of the universe, infinite stars, asteroids, or planets may exist. In a multiverse of infinite universes, the universe of universes in an infinite multiverse would itself be infinite. In an infinite human history, infinite human populations may exist. In a study on the efficacy of a drug, applicable to an infinite number of human beings, in a possible infinite human history, the universe would be infinite. In a study for the development of intelligence, applicable to infinite students,

the universe of students would be infinite, in the infinity of students of a possible infinite human history. A universe of infinite subjects or options is one in which the universe is not limited—it is infinite—although it can include the study of populations in a given history, and under certain circumstances, studies of discrete categories.

In a population study, the provisional universal inference will be provisionally valid across the entire universe that constitutes the given population. In universes of infinite subjects or options, the way to study the universal tendency is by inferring tendencies from a sample to the universe, with *N* being the number of subjects or options. If a greater number of *N* subjects or options gives greater representativeness of the sample, then there is less representativeness error. If a smaller number of *N* subjects or options gives lesser representativeness of the sample, then there is greater representativeness error. The relationship between *N* and representativeness of the sample is directly proportional, and therefore the relationship between *N* and sample representativeness error is inversely proportional.

If the relationship between sample representativeness error and *N* is inversely proportional, then the inverse of *N* is the probability of sample representativeness error in universes of infinite subjects or options. The probability of sample representativeness error will tend to decrease as *N* increases, and will tend to increase as *N* decreases. The inverse of *N* is denoted "1/N." Whenever the symbol "1/N" appears in *Impossible Probability*, it will mean the inverse of *N*. In addition, the inverse of *N*, 1/N, will fulfill other functions, both in universes of infinite subjects or options and in universes of limited options.

Universally, for universes of infinite subjects or options and for universes of limited options, the inverse of *N* (1/N) will be the arithmetic mean of the occurrences and the theoretical probability of occurrence by chance in equal opportunities. Only for samples drawn from universes of infinite subjects or options (including populations) will the inverse of *N* be equal to the probability of sample representativeness error, and to the probability of theoretical dispersion or deviation, the theoretical error of oscillation around central tendency, the central tendency in theory being the inverse of *N*. The study of the inverse of *N* in discrete category models will be explained in section

ten. For now, without anticipating contents, what matters is the following idea: for every universe of infinite subjects or options, including populations:

1/N = theoretical probability of occurrence by chance, probability of theoretical dispersion, and of sample representativeness error in universes of infinite subjects or options, including populations.

1 – 1/N = Theoretical Reliability, in universes of infinite subjects or options, including populations.

3.3.10.2. Error and Reliability in universes of limited options in universes of infinite frequencies or raw scores

Universes formed only by the *N* options. For example: if I toss a coin infinitely many times, I have only one universe limited to two options—heads or tails—normally, although exceptionally, the coin might land "on edge," that is, on the rim of the circumference and not on one of its faces. If I randomly select a group of people from the infinity of people that may exist in a possible infinite human history, the [biological] gender universe is limited to two options: female and male, woman or man—normally, although exceptionally there may be hermaphrodites, which could be described as a genetic error of nature.

If I toss a dice infinitely many times, I will have an infinity of occurrences within the universe limited to the six faces of the dice. If in a democracy *N* candidates or *N* delegates stand for election, then the voting options are limited to the *N* optional candidates or *N* optional delegates—normally, although exceptionally blank or null votes may exist, as well as abstention.

In a universe of limited options, the possible universe of occurrences can only be distributed among the limited options that make up that possible universe, though exceptional situations may exist: the coin landing "on edge" on the rim, a child being hermaphroditic, or an election including blank votes, null votes, and abstention. Except

for these exceptions, normally, if a coin is tossed, it will come up heads or tails; if a woman is pregnant, normally it will be a [biological] girl or a boy; in democratic elections, normally the portion of the population exercising its right to vote will be greater than the portion that abstains, and within the voting population, blank or null votes will normally not exceed positive votes for one of the possible candidates or delegates. These are the normal options: heads or tails, girl or boy, positive vote for a candidate or delegate—the options that normally delimit the universe in a universe of limited options, such universe being limited to the possible options that define it.

Thus, a universe of limited options, within a possible universe of infinite frequencies or raw scores, extracts only a sample. For example: the universe formed by a coin is normally limited to two options (heads or tails), but the frequencies that can be obtained—or raw scores associated with heads or tails—can be infinite, since infinite tosses can be made. Insofar as human history may be infinite, and there may be an infinity of people, the frequencies or raw scores that may be associated with the distribution of men and women in any social activity may be infinite. If we toss a dice, the distribution of occurrences associated with each of the six numbers (associated with each face of a six-sided die) can be infinitely different, since infinite tosses can be made.

The options are limited, but the frequencies or raw scores can be infinite. If the same candidates or delegates were to stand an infinite number of times in democratic elections, the possible empirical distributions of the voting population would be infinite. The material problem lies in *human physiology* itself, which allows the human being only a finite period of vital activity: a given candidate can only stand for election a limited number of times in his or her lifetime, just as voters will only exercise their right to vote during the limited time of their existence.

Thus, although within universes of limited options there exists the possibility of infinite raw scores or frequencies—where the frequency of each option is the raw score of that option—it may occur that a universe of limited options cannot be distributed infinitely, but only over a concrete population. In that case, it is a study of options limited to a determined population. In general, however, it will still have the same characteristics as any other universe of limited options—with the difference that the maximum

inversion of raw scores or frequencies, when it is a concrete population being distributed among the options, is the inversion of the total population, which will be the minimum possible sample representativeness error. For if the study of frequency distribution over the options is made over an entire population, then the inversion of the entire population will be the smallest possible representativeness error, since the entire population is represented in the study as a sample.

In this way, insofar as in the study of limited options the inversion of raw scores or frequencies (the frequency of each option being the raw score of each option), the inversion of the sum of all raw scores or frequencies is the sample representativeness error—except in zero-sample models, which will be an exceptional model in the theory of universes of limited options—there will also be other forms of error in universes of limited options and in models of limited options of variable magnitude.

3.3.10.2.1. The inverse of raw scores or frequencies will always be the probability of sample representativeness error in every model of universes of limited options, as will be explained. However, it must be noted that exceptions may exist, and situations in which other forms of error must be understood simultaneously.

3.3.10.2.1.1. An exceptional situation in universes of limited options is that which occurs when the ideal is the *zero-sample*. If in a universe of limited options the ideal would be that all options have empirical probability zero, then the inverse of raw scores or frequencies would not itself be the sample representativeness error, because if the ideal is that raw scores or frequencies be zero, then the error itself in the sample are the raw scores or frequencies themselves.

3.3.10.2.1.2. In absolutely every universe of limited options—except if the ideal were the zero-sample, and except for this single exception—then in all other possible models of universes of limited options, the probability of sample representativeness error will be the inverse of raw scores or frequencies. This can, however, be compatible with other forms of error, as in universes limited to two options, where the inverse of N may represent the greatest possible empirical dispersion.

3.3.10.2.1.3. Furthermore, another possible error that can be compatible with the inverse of raw scores or frequencies in universes of limited options arises when the

magnitude *N* of the limited options is a variable magnitude—for example, in universes limited to discrete categories—where the inverse of *N* will be the representativeness error of the variable *N* options. For instance, in discrete category models, the inverse of *N* will be the probability of representativeness error of the discrete categories.

3.3.10.2.1.4. Except where the ideal of the options limiting the universe is zero raw scores or frequencies—except for this case—the normal rule will be that in universes of limited options, absolutely always, the inverse of raw scores or frequencies is the probability of sample representativeness error. Under certain conditions, however—such as models limited to two options, or models with a variable magnitude *N* of options—other forms of error may appear. But essentially, the inverse of raw scores or frequencies is the probability of representativeness error of the selected sample of raw scores or frequencies.

3.3.10.2.2. In a universe of limited options, insofar as the options are limited, the number of options equal to *N* gives rise to an inverse of *N* that is not representative either of theoretical dispersion or of sample representativeness error. This is because in a universe limited to *N* options, the true sample selection is not *N*, since *N* is predetermined by the universe. Although in universes of discrete categories the inverse of *N* will have values similar to those in universes of infinite subjects or options, in general, in universes of limited options the true sample selection is the sample of frequencies or raw scores. For example, in a study of heads or tails, or in a study of the percentage of women and men in society, what is truly determinant in the sample is not that *N* equals heads or tails, or *N* equals man or woman. What is determinant in a heads/tails study is the number of coin tosses—the number of coin tosses is the true sample selection. In a study of the distribution of women and men in society, the true sample is the number of people studied in the distribution. To study the representativeness of democratic elections, true representativeness is in the number of people who have exercised their right to vote: the larger the number of voters who exercised their right, the greater the social representativeness of the elections and the greater the reliability of the results. The smaller the number of voters who exercised their right, the lesser the social representativeness and the lesser the reliability of the elections. In summary, in universes of limited options, the true sample selection—on

whose inverse will depend the probability of theoretical dispersion and the probability of sample representativeness error—will be the sum of the frequencies or raw scores.

3.3.10.2.3. If in universes of limited options—normally, except for the exceptional case of zero-samples—the inverse of the sum of frequencies or raw scores, as the true total number of occurrences, is the probability of sample representativeness error and the probability of theoretical dispersion, then dispersion and error are dependent variables, inversely proportional to the sum of frequencies or raw scores in universes of limited options. Meanwhile, the theoretical probability of occurrence by chance, in equal opportunities, will always, and invariably, be the inverse of *N* (1/N), the arithmetic mean of empirical probabilities. In universes of limited options, the probability of theoretical dispersion and the error of sample representativeness will equal the inverse of the sum of frequencies or raw scores—what will simply be called the inverse of raw scores or frequencies. Thus, in universes of limited options, the inverse of raw scores or frequencies will be the theoretical error of oscillation around central tendency, central tendency being invariably represented by the inverse of *N* as theoretical probability of equal opportunities by chance.

3.3.10.2.4. If mathematically the sum of raw scores or frequencies is symbolized by "$\sum x_i$," then the inverse of raw scores or frequencies will be equal to "$1/\sum x_i$." Therefore, the inverse of raw scores or frequencies will be equal to the probability of sample representativeness error in universes of limited options. Insofar as the larger the sum of raw scores or frequencies, the greater the sample representativeness, then the larger the sum of raw scores or frequencies, the smaller the probability of representativeness error in universes of limited options. Thus, the inverse of raw scores or frequencies, $1/\sum x_i$, is equal to the probability of sample representativeness error of the sample of frequencies or raw scores in universes of limited options.

3.3.10.2.5. If mathematically, the greater the sample representativeness, normally under random conditions, the smaller the theoretical dispersion, and the lesser the representativeness, normally under random conditions, the greater the theoretical dispersion, and if the sample in universes of limited options is normally formed by the sample of frequencies or raw scores, then necessarily in universes of limited options the inverse of raw scores or frequencies, $1/\sum x_i$, is equal to the probability of theoretical

dispersion (or deviation) and to the probability of sample representativeness error. In all cases, the inverse of *N* will also be the theoretical probability of occurrence by chance and the invariable arithmetic mean. Only in universes of limited options will the probability of theoretical dispersion and the theoretical error of representativeness be equal to the inverse of raw scores or frequencies.

1/N = theoretical probability of occurrence by chance, arithmetic mean.

$1/\sum x_i$ = probability of theoretical dispersion and probability of representativeness error of frequencies or raw scores, in universes of limited options.

$1 - 1/\sum x_i$ = Theoretical Reliability in universes of limited options.

3.3.11. The inverse of *N*, that is, 1/N, and the inverse of raw scores or frequencies, $1/\sum x_i$, will be two of the foundational concepts of *Impossible Probability*. Insofar as the inverse of *N* (1/N) and the inverse of raw scores or frequencies ($1/\sum x_i$) are multifunctional values: the inverse of *N* is at the same time the arithmetic mean and the theoretical probability of occurrence by chance, the probability of theoretical dispersion, and the probability of sample representativeness error in universes of infinite subjects or options, including population studies of subjects or options. In universes of limited options, the inverse of *N* will remain the theoretical probability of occurrence by chance and the arithmetic mean. However, in universes of limited options, it will be the inverse of raw scores or frequencies, $1/\sum x_i$, that constitutes the probability of theoretical dispersion and the probability of sample representativeness error.

3.3.12. For any kind of sample—whether of subjects or options, or of options only—whatever the form of the sample, the empirical probability of a subject or option, in any kind of universe, will be equal to the individual raw score or frequency divided by the sum of raw scores or frequencies (Second Method of October 16, 2002), for absolutely every possible universe.

3.3.12.1. For those studies in universes of infinite subjects or options where measurement of raw scores or frequencies is made on a scale of integers that may be positive or negative, or only negative, the estimates of empirical probability will be made on the absolute value of the raw score, without sign, insofar as what empirical probability measures is the proportion borne by the absolute value of the raw score with respect to the other raw scores, regardless of sign.

3.3.12.2. I developed the idea of empirical probability in universes of infinite subjects or options because there exist situations where the empirical probability of a subject or option, in such universes, is a correct estimate for projecting the future. If in a mathematics exam, at any educational level, a student obtains a given score, the probability that that student will solve a mathematics problem at the same educational level—compared to classmates—will be equal to the ratio of that student's raw score to the total of scores in the sum of all students' scores at the same educational level.

3.3.12.2.1. Thus, if the *normal Bias Level* of a subject or option (empirical minus theoretical probability) is positive, it will indicate that the student's empirical probability of performance in mathematics is higher than that of the rest of classmates—becoming more significant the higher it is with respect to a sufficient critical reason, which can be studied as **Validity of Positive Bias**, in addition to other within-measure models of rational critique of positive bias presented in section 11.

3.3.12.2.2. If the normal Bias Level of a subject or option is zero or tends to zero, it will mean that the student's empirical probability of performance in mathematics is similar, or tends to be similar, to that of the rest of classmates—a tendency toward equality that could be studied via **Validity of Equality** and other within-measure models of rational critique of equality set out in section 11. If a teacher were experimenting with a new teaching methodology, and the raw scores showed that students had passed the mathematics tests, and moreover the statistical probability study showed empirical probabilities tending toward theoretical probability, it would be an indication that the new experimental methodology is valid—provided it is rationally critiqued, at both individual and sample level, for any student of similar characteristics.

3.3.12.2.3. If the normal Bias Level of a subject or option were negative, it would indicate that the student's empirical probability of performance in mathematics is lower than that of classmates—showing the need for some kind of reinforcement or educational support. Depending on how far the empirical probability falls below the theoretical, the greater the gap—at least beyond a critical level for learning—the greater the support or reinforcement required. This critical level for learning could be studied in **Validity of Negative Bias** and other within-measure models of rational critique of negative bias in section 11.

3.3.12.3. If, in a study on a representative sample of different types of supernovae occurring in the universe, one studies the amount of energy released as a function of the masses of the stars observed just before the explosion, and the empirical probability for each star is its amount of energy released divided by the total energy released by all supernovae in the sample, then, if any other star in the universe generated the conditions of possibility giving rise to a supernova, the empirical probability of potential energy to be released by any other star in the universe—of mass similar to any of those in the sample—will be equal to the empirical probability of energy released by that star in the sample of similar mass, unless some other variable intervened, in which case it should be included in the model. One way to include variables not always known or controlled is to include margins of error within which we accept that a real measurement lies inside the *a priori* estimation parameters—the empirical prediction of the phenomenon. For example, accepting that, within a given margin of error, the empirical probability estimates of energy released by a supernova according to the star's original mass are acceptable estimates within the margin of error.

3.3.12.4. In summary: just as in limited universes empirical probability is an estimate of the degree of possibility of an occurrence, in infinite universes empirical probability is an estimate of the degree to which a quality is expressed in an event.

3.3.12.5. In studies of universes of infinite subjects or options where the measurement scale ranges from negative to positive values, or only negative, for the sum of raw scores and the estimation of empirical probabilities, one will always take the absolute value of the raw score, without sign.

3.3.12.6. Thus, the empirical probability of a subject or option, in any universe and on any measurement scale, will be equal to the absolute value of the raw score or frequency divided by the sum of the absolute values of the raw scores or frequencies.

3.3.12.7. When the mean surface temperature of a star is measured, what is expected is that the magnitude of temperature rises; or, in the absence of any other variable, that the polar temperature on any planet be extremely low. A high empirical probability for the surface temperature of a star, or for the temperature of a planet's polar regions, are indications of how a quality—temperature—is expressed, tending toward extreme values; if working in degrees Celsius, maximum values the further they deviate from zero degrees Celsius, whether upward or downward.

3.3.12.8. In studies in universes of infinite subjects or options that include positive or negative raw scores, empirical probability measures a projection of dispersion relative to zero—the boundary point between positive and negative values.

3.3.12.9. In a study of thermal dispersion in degrees Celsius, insofar as empirical probability will be the absolute value of the raw score divided by the sum of absolute values, empirical probability measures the probable dispersion of temperature relative to zero degrees Celsius. Regions with extreme temperatures—whether high or low—will have the highest empirical probabilities, which will be an indication of thermal dispersion. If, in a study for locating sites for *future human colonies in space, or for the search for life on other planets*, non-extreme temperature zones were to be valued positively, a low empirical probability of temperature would be an indication of a climate around zero degrees Celsius.

3.3.12.10. In a study in a universe of limited options where the options are values that may be positive or negative—for example, universes limited to discrete categories where the limits defining the category intervals may be negative or positive—regardless of the sign of the interval limits, empirical probability will be individual frequency divided by the total. Thus, the sign of the interval limits will in no way affect empirical probability, which will remain a reliable projection of statistical probability of occurrence of events in each category.

3.3.12.11. Since studies in universes of infinite subjects or options that use integer scales from minus infinity to plus infinity are but one case among many possible, normally we shall say that the empirical probability of a subject or option in any universe is raw score or frequency divided by the sum of raw scores or frequencies—stating, where applicable, that for studies in universes of infinite subjects or options whose measurement scale is integers from negative to positive values, the value of the raw score used to estimate sums and empirical probabilities will be taken as the absolute value, ignoring the sign.

3.3.13. Since empirical probability equals the magnitude of the occurrence or the intensity of the quality divided by the sum of magnitudes or intensities in the sample, probability is thus the quantitative expression of the self over the quantitative expression of the sample—in essence, a quotient relation between the individual and the sample, the individual and the social/sample, the individual tendency within the society or sample. Empirical probability is the individual empirical tendency within the sample.

3.3.14. The normal Bias Level and the normal Similarity Level relate empirical and theoretical probability—by a differential in the normal Bias Level, or by a logarithm of the quotient in the normal Similarity Level. In the particular case of normal dispersion models that can vary between zero and maximum dispersion, there are also the Validity tests: **Validity of Equality** equals *critical probability minus absolute value of normal Bias Level*; accept if zero or positive, where the critical probability will be the error margin. **Validity of Positive Bias** equals *Bias Level minus critical probability*; accept if zero or positive, with critical probability as the reliability margin. **Validity of Negative Bias** equals *(inverse of N minus empirical probability), then minus critical probability*; accept if zero or positive, with critical probability as the reliability margin. I developed the Validity models on January 12, 2010 for the rational critique of normal models whose dispersion varies between zero and maximum. For those models under omega *conditions* where dispersion must lie at an ideal dispersion, different *rational-critique models* will be presented.

3.3.15. Whether a tendency is sufficient depends on whether the tendency demonstrates behavior rationally in accord with the critical reason.

3.3.15.1. The ideal model of critical reason is the **critical probability**, and the calculation of critical probability is normally equal to the product of the percentage *X* of error (divided by one hundred) in error studies, or the percentage *X* of reliability (divided by one hundred) in reliability studies, multiplied by a maximum or ideal tendency (normally). The ideal model of critical reason is the ideal error margin or ideal reliability margin one is willing to accept in the realization of the ideal (normally). *Mathematics is the idealization of reality for the realization of the ideal*.

3.3.15.1.1. Validity of Equality: *critical probability minus absolute value of Bias Level*; accept zero or positive insofar as the absolute value of the Bias Level is equal to or less than the critical probability. Critical probability equals the product of the percentage *X* of error (divided by one hundred) by *(1 − 1/N)*.

3.3.15.1.2. Validity of Positive Bias: *Bias Level minus critical probability*; accept zero or positive insofar as the Bias Level is equal to or greater than the critical probability. Critical probability equals the product of the percentage *X* of reliability (divided by one hundred) by *(1 − 1/N)*.

3.3.15.1.3. Validity of Negative Bias: *(1/N − empirical probability)*, and the result minus a critical probability; accept zero or positive insofar as the difference *(1/N − empirical probability)* is a difference equal to or greater than the critical probability. Critical probability equals the percentage *X* of reliability (divided by one hundred) times *(1/N)*.

3.3.15.2. Dialectical logic begins from the identity of opposites. In *Impossible Probability*, the identity of opposites is a logically necessary dialectical error: opposites are identical within the margin of error one is willing to accept. Our idea of reality and reality itself will be identical within the margin of error we are willing to accept. The first error we must be willing to accept is the sample itself—even if, in a rational-critique model, one accepted only a critical probability corresponding to 100% reliability or 0% error. Even if the ideal critical reason were devoid of error, the moral *judgment* issued by scientific policy in the statistical decision would be subject to the logical error of the inverse of the sample (normally). To make decisions is to accept errors—error and decision are identical because they are opposed, within the margin of error one is willing to accept.

3.3.16. Error and reliability are identical because they are opposed. Every reliable decision issued by scientific policy will always be subject to a margin of error. Every moral variable—judgment—dependent on a possible margin of error will, inevitably, be a deferred moral error in time, when the moment of truth arrives. Every scientific decision to accept a margin of error is essentially the acceptance of an error. To accept an error is to accept an error. Every critical reason, in an error study based on a percentage *X* of error, is the acceptance of an error in moral judgment proportional to the variable percentage *X* of error. Every critical reason, in a reliability study based on a percentage *X* of reliability, is the acceptance of an error in moral judgment proportional to *(100 − X)*, the difference between one hundred and the variable percentage *X* of reliability. And even any moral judgment on a given sample—even if, in the ideal critical reason (critical probability), it accepted only 0% error or 100% reliability—will always be a moral variable dependent on the sample upon which the political inference was made. The morality of the judgment varies in proportion to *(1 − inverse of the sample)*, i.e., *1 − (probability of sample representativeness error)*. In essence, *(1 − inverse of the sample)* measures the moral Theoretical Reliability of the statistical decision issued by scientific policy in the judgment to make the political inference. In universes of infinite subjects or options, the probability of sample representativeness error is *1/N*; in universes of limited options, it is the inverse of the raw scores or frequencies.

3.3.17. Probability, as a quotient, is therefore a rational number; hence each probability is in itself a *ratio* in itself.

3.3.18. If every probability is a rational number—and in itself a ratio in itself—then a **critical probability** is a *critical ratio* in itself. The critical probability is the ideal critical reason, insofar as it will normally be the product of the percentage *X* (of error or of reliability, divided by one hundred) times a maximum or ideal tendency depending on the object of study (equality or bias—positive or negative) and on whether it is an error or reliability study.

3.3.19. If every critical probability is a critical reason in and of itself, then every test contrasting an empirical model against the critical probability is a practice or activity of critical reason. For positivism, philosophy is an activity; for dialectic, philosophy is praxis. The contrast of ideas is the activity or praxis of philosophy. The essence of

critical reason is to contrast ideas over a percentage of error or reliability; in any case, every percentage of reliability implies a percentage of error equal to *(100 – reliability%)*. Therefore, every contrast of ideas is a contrast over a margin of error; and even if one accepted only 0% error or 100% reliability, the contrast of ideas would still be subject to the probability of sample representativeness error—normally, the inverse of the sample. In summary, every contrast of ideas is the contrast of ideas over the error one is willing to accept.

3.3.20. Every contrast by critical reason is a rational critique. The validity of the tendency will depend on whether, in the rational critique, the tendency is sufficient to be a tendency to be provisionally rational truth. The method of *Impossible Probability* is the **syllogism of tendency**; what is normally studied is the tendency. Critical reason is the critique of the tendency to determine whether the tendency is accepted as sufficient. A sufficient tendency is that rational tendency which transcends physiology—denying and overcoming physiological appearance—to be sufficiently scientific, ideally moral, true (albeit moral truth relative to the margin of error), thus becoming only provisionally part of objective reality. Every transcendent positive fact, by its very transcendental category, becomes an historical fact—hence not absolute—a category transcendent on the space-time plane.

3.3.21. *Impossible Probability* is critical rationalism because it rationally critiques the sufficiency of the tendency; the method of *Impossible Probability* is the syllogism of tendency.

3.3.22. Everything sufficient is rational, insofar as for something to be rational it suffices that it be sufficient.

3.3.23. Every hypothesis is a way of explaining or understanding a reality from an idea—which in itself is potentially ideology—whose reliable validation will depend on scientific policy. Every scientific hypothesis, as explanation or understanding, is an ideological hypothesis about what science itself is. The acceptance or rejection of the ideology of a hypothesis depends on the political ideology of scientific policy. The first decision of scientific policy is to accept the sample's margin of error; the second scientific-political decision is to accept the critical reason. The activity or critical

practice of critical reason will produce the statistical decision of scientific policy, which in any case—whether in the natural or social sciences—will always be a moral judgment. To accept or reject the Big Bang hypothesis, or the Higgs particle; to accept or reject the hypothesis of the possibility of human biotechnological modification; to accept or reject the hypothesis of a possible increase in the replacement of man or woman by the machine—this is, in essence, to accept or reject ideological, moral ways of politically understanding and explaining natural or social reality.

3.3.24. For each model of scientific policy, the definition of a sufficiently rational hypothesis will depend on its political stringency in the margins of error or reliability for accepting only truth.

3.3.25. In the **Validity of Equality** equation—*critical probability minus absolute value of normal Bias Level*—critical probability equals *(percentage X of error / 100) × (1 − 1/N)*. Only zero or positive results are accepted in the difference *critical probability* − |*Bias Level*|. This means that only those propositions whose absolute normal Bias Level is equal to or less than the critical reason will be accepted as sufficiently rational—that is, the Bias Level is within the accepted margin of error, the accepted margin of error being the critical probability; the critical reason is the margin of error accepted. Both the sample selection and the percentage *X* of error are margins/percentages of error accepted by scientific policy, upon which a moral judgment—the statistical decision—is issued.

3.3.26. In **Validity of Positive Bias**—*Bias Level minus critical probability*—critical probability equals *(percentage X of reliability / 100) × (1 − 1/N)*. In Validity of Positive Bias, only zero or positive is accepted insofar as the Bias Level is equal to or greater than the critical probability. **Validity of Negative Bias**: *(1/N − empirical probability)*, and the result minus critical probability; critical probability equals *(percentage X of reliability / 100) × (1/N)*. In Validity of Negative Bias, only zero or positive is accepted insofar as *(1/N − empirical probability)* is equal to or greater than the critical probability. In both Validity of Positive Bias and Validity of Negative Bias, since critical probability is calculated on a percentage *X* of reliability, the statistical decision is issued over the percentage of error equal to *(100 − reliability%)*. Every statistical decision that scientific policy issues within the percentage of error—whether a direct error percentage in

Validity of Equality, or an error percentage deduced as *(100 − reliability%)*—is a percentage of error within which an empirical hypothesis is accepted or rejected. And even if that percentage of error were zero (and thus reliability were 100%), in any case scientific policy would already have accepted the margin of error derived from the sample itself.

3.3.27. In Validity—even if scientific policy accepted only 0% error in critical probability in equality of opportunities, or 100% reliability in a bias study—the moral judgment on the objectivity of scientific policy would depend on the margin of error proportional to the inverse of the sample, as the probability of sample representativeness error: *1/N* in universes of infinite subjects or options; the inverse of raw scores or frequencies in universes of limited options.

3.3.28. To say that a hypothetical idea is identical to reality within a margin of error is to say that the idea—product of an electrochemical sequence within our brain—is identical, outside itself, to the electrochemical sequences of reality external to the brain, making the idea for itself within the margin of error we are willing to accept.

3.3.29. To say that the quantitative is identical to the qualitative implies accepting that a quality materially in itself, external to the brain, is represented outside itself by a **cerebral electrochemical product that we call *number***; and that the whole human being—the infinite universe of qualitative dimensions—can ideally measure it numerically for itself within the margin of error one is willing to accept, in the contradiction of the finite being who seeks to know, in an ideally objective quantitative way, a subjective reality of infinite qualitative dimensions, in the mathematical progress of partial knowledge of reality-in-itself.

3.3.30. To say that the object is identical to the subject within a margin of error is to say that everything ideally objective may in reality be subjective, and everything really subjective may be rationally objective—within the margin of error we are willing to accept. With a larger margin of error, what we believe to be ideally objective may in fact be merely subjective; an “objective” belief under a non-demanding error margin can be subjective. With a smaller margin of error, the objective will remain really objective for

a longer period. Critical reason is the boundary between objectivity and subjectivity, the rational and the irrational, isomorphic truth and physiology.

3.3.31. To say that *A is B* within a margin of error is to say that the tendency of *A* to be *B* is a sufficiently rational tendency, and within the limits of our margin of error we make the decision to accept or reject the tendency of *A* to be *B*.

3.3.32. Every identity is identical insofar as it is an identity within a margin of error, where that margin of error sets the critical limits of our decisions.

3.4. Concept of possibility

3.4.1. Every possibility implies the idea of an option, alternative, or category among other options, alternatives, or categories. The very idea of possibility necessarily requires the existence of different possibilities, among which that possibility is one. If there is only one possibility, then it is not really a possibility, because the idea of possibility necessarily requires more than one possibility. If there is only one possibility, then it is not really a possibility but in fact an absolutely deterministic model, where a genuinely stochastic reality is not possible. One can truly speak of possibility only when one possibility is one among others, not the only one; if it is the only one, it is not really a possibility—it is a logical or moral determination. The existence of one possibility among other possibilities implies the logical absence of absolute determination; yet if there are *options, alternatives, or categories* that are more moral than others, the moral is always the moral option over the immoral, the moral alternative over the immoral, or the moral category over the immoral. Ideally one would always be logical, ethical; the dialectical stance is to accept a margin of error in logical identity; the political stance is to determine what margin or percentage of moral stringency to accept in aligning identity with the ideal ought-to-be. If any option, alternative, or category can occur in equality of opportunities, then it is a completely random model. If one option, category, or alternative is more possible than others that are less possible, we say the distribution of reality is biased in favor of certain options, alternatives, or categories. *A priori* scientific policy must establish the ideals of science in order to study morality as the ought-to-be, the truth—albeit provisional—so as to be at least a sufficient tendency.

3.4.2. In any case, whether biased or not, if something is possible, then in sufficient or infinite time it is inevitable—even if it seems impossible—provided it is truly possible in an infinite universe.

3.4.3. Bias influences but is not determinative; in reality anything can happen, although if predetermined to limited options only what is predetermined can occur.

3.4.4. If I flip a coin for a sufficient or infinite time, sooner or later it is inevitable that it will be heads or tails, or tails or heads. Perhaps, in a gambling house, the roulette is rigged, but it does not matter: in sufficient or infinite time every option is inevitable. The question is whether the gambling house will remain open at least long enough; if it were open infinitely, it would be only a matter of time—were it not that human life is limited, everything would be possible within a single life.

3.4.5. If I play dice, then in a sufficient or infinite number of throws every possible combination is inevitable. Human life is not infinite, so the problem is to know whether we have sufficient time for at least the necessary to occur—even if only in a possible part—and whether that possible part is sufficient.

3.4.6. Everything—absolutely everything—possible, within a margin of coherence, logical or moral, in the struggle for ideals, is inevitable if there is an infinite history.

3.4.7. Every subject or option, insofar as it is really real, exists materially, and is therefore inevitable in sufficient or infinite time. The only ethical way, in a universe limited to moral options, to guarantee a future is by ensuring that the only future options that exist are moral options. In limited universes—that is, in universes of limited options—if when flipping a coin there are only two options, heads or tails, and the option "*y*" does not exist, then heads or tails will be inevitable in sufficient or infinite time, but the option "*y*" will be absolutely impossible when flipping a coin, because the option "*y*" does not exist—the coin only has the options heads or tails, being a universe of limited options. If when flipping a coin there are only two options, heads or tails, and the option "*z*" does not exist, then heads or tails will be inevitable in sufficient or infinite time, but the option "*z*" will be absolutely impossible because it does not exist in a universe of limited options. If when throwing a six-sided dice the option "7" does not exist, then the option "7" will be absolutely impossible when throwing the die, although

the options numbered “1” through “6” will be inevitable in sufficient or infinite time; but “7” will never appear when throwing the die because “7” does not exist on the dice. If in a democracy no candidate or delegate were racist or xenophobic in any of its forms, there would be no possibility of racist or xenophobic governments.

3.4.8. The eternity of the human species depends on a possible and variable human history—possibly infinite in time if nothing occurs to prevent it—which can only be possible under two premises: the progress of humanity toward moral ideals, and the scientific progress that allows humanity to resolve the accidents of the universe.

3.5. Probability and possibility

3.5.1. *Impossible Probability* is founded on the idea that the value zero must be the universal critical value; in fact, strictly speaking, *Impossible Probability* is zero probability.

3.5.2. Everything distinct from *Impossible Probability* has a probability different from zero.

3.5.3. Empirically possible probability is that probability different from zero.

3.5.4. Everything possible is probable insofar as it is an existing alternative—that is, inevitable in sufficient or infinite time—however improbable it may appear when it has a probability close to zero, that is, close to *Impossible Probability*. Since, so long as it is only close to *Impossible Probability* but not equal to it, this implies it is different from zero—and insofar as it is different from zero it is always possible, however improbable it may seem—and everything possible is inevitable in sufficient or infinite time. The reason for referring to inevitability in sufficient or infinite time is largely that it is often difficult to weigh what that sufficient time is; but in any case, given infinite time, it is inevitable. If I play a game of chance and always bet on the same combination, it is inevitable that all possible combinations will occur. We may not know what the sufficient time is for every possible combination to be inevitable, but if we have infinite time, sooner or later, it will be inevitable. If we do not have infinite time, and our time is limited, it may be that the limited time in which combinations occur is not sufficient, and in our limited time not all possible combinations will be possible. The more time

there is, the greater the probability that something possible will occur; the less time there is, the lower the probability that something possible will occur. If one played the same number on the roulette wheel over an infinite history, it is only a matter of time before one wins. In sufficient or infinite time, everything—absolutely everything—is inevitable. If we have infinite time, then sooner or later absolutely everything possible will occur; and even, as will be seen later, in universes of truly infinite subjects or options—that is, truly infinite universes, infinite in all their dimensions, both in the number of subjects or options and in the availability of infinite time—even the impossible is possible, so long as it is minimally coherent with the existing reality; the impossible may even be inevitable in universes infinite in all their dimensions.

3.5.5. Every possibility, however improbable it may appear, is inevitable in sufficient or infinite time; sooner or later it will have to happen if we have no time limit—i.e., infinite time—or if our time limit is sufficient for everything possible to occur. In any kind of universe—whether a universe limited to options or an infinite universe of subjects or options—if sufficient time is not available, any option can be avoidable during the insufficient time of occurrence.

3.5.6. Everything possible is inevitable in sufficient or infinite time. To say "everything possible" means only—and only—everything that really exists or will exist. The point is that we only know what exists, while we can only predict what will exist, and within the logical margin of error, in the dialectical identity, that policy is willing to accept.

3.5.7. Every possibility of existing is possible within the conditions of possibility.

3.5.8. The most important condition of possibility for existence is that the condition of necessity is met—that is, that the possibility is necessary.

3.5.9. Every necessary possibility is necessary by chance. Motion is a mere sequence of accidents and contingencies. Everything we believe to be determinant was an insignificant accident.

3.5.10. Necessity in the accidental and contingent chain is due to causal, correlational, or multi-correlational chains—essentially stochastic; the insignificant may, by chance, be the principle of the determining phenomenon.

3.5.11. Natural law is the law of probabilities; the law of probabilities is the law of chance; *the law of chance is natural goodness*.

3.5.12. The dialectic of the possible is Hegel's dialectic, but without metaphysics, because the only "supernatural," insofar as it is above the natural, is the *artificial*; and insofar as it is the opposite, the artificial is natural, as a social product, the social itself being natural. ***A moment may even arrive in history when everything natural is artificial***—it is a matter of time. In fact, truth is a simple matter of time—provided science has sufficient or infinite time.

3.5.13. Every existence that is temporally sufficient or infinite is an inevitable existence, however insignificant its probability may be, however close to *Impossible Probability* its probability of existing may be; every probability different from zero is inevitable in sufficient or infinite time.

3.5.14. Now, to say that everything that exists is possible in sufficient or infinite time implies that there comes a moment when absolutely everything, in universes of infinite subjects or options with infinite time—including what is theoretically impossible for having probability zero—is likewise possible to exist. In infinity, everything—even the impossible—becomes inevitable existence, in truly infinite universes of infinite subjects or options in all their dimensions, which includes being a universe infinite in infinite time.

3.5.15. Suppose a universe of infinite events. In a universe of infinite subjects or options, any random event divided by an infinite series of events will have a probability equal to zero point followed by an infinite decimal period of zeros.

3.5.16. Zero point followed by an infinite decimal period of zeros is, in any case, a tendency toward zero. The method of *Impossible Probability* is the syllogism of tendency; a zero point followed by an infinite decimal period of zeros is undoubtedly a sufficient tendency toward zero. In fact, mathematically, if one had to truncate a decimal period of 0.000... with infinitely many zeros, the truncation would be equal to zero. Zero probability is *Impossible Probability*.

Probability = (X ≠ 0) / ∞ = 0000000000000000000.....0 = 0

3.5.17. A dialectical contradiction is that, if at first only what is possible is inevitable, in sufficient or infinite time; if, over an infinite time, a universe of infinite events is possible—a universe of infinite raw scores or frequencies, in a universe of infinite subjects or options, in a spatiotemporally infinite universe—and one calculates the probability of one event among infinite events, the result of one real event among infinite real events is equal to zero as a decimal period of infinite zeros, which is a sufficient tendency toward zero. In decimal truncation that equals zero, since a sequence of zero point with an infinite period of decimal zeros—zero point with an infinite zero decimal period, where the decimal period of zeros is infinite—is an endless period of decimal zeros; zero point followed by an endless string of zeros is a probability equal to zero, *Impossible Probability*.

[(X ≠ 0) / ∞ = 0000000000000000000.....0] – 0 = 0

3.5.18. Now then, in a universe of infinite subjects or options, if one event among infinite events—a raw score or frequency different from zero—among infinite frequencies or scores—is equal to zero point with an infinite decimal period of zeros, and this mathematically is zero point followed by endless zeros, which amounts to saying that one event among infinite events has probability zero, then this means that the probability of that event is equal to zero; an event that has been possible becomes *Impossible Probability* in the infinite, having nevertheless been a possible event, insofar as the event, as such, within the chain of infinite events, is one of them—thus an event whose probability, in the infinite, becomes, at the same time, an impossible possible.

3.5.19. In a truly infinite universe in all its dimensions, there would be the logical contradiction that the quotient of the magnitude of any event among the infinite events by the tendency to infinity of the sum of the infinite magnitudes would be equal to a tendency toward zero, which, for mathematical purposes, in the process of decimal truncation, is tantamount to saying probability zero, *Impossible Probability*—the same *Impossible Probability* that any other event would have that, although likewise possible, nevertheless did not occur.

$$[\,(X = 0) / \infty\,] = [\,(X \neq 0) / \infty\,] = 0{,}000000000000000000 = 0$$

3.5.20. If an empirical real event—a raw score or frequency different from zero—that has already occurred has *Impossible Probability*, probability zero, of occurring, in the infinite, and yet has occurred—its real and true occurrence has been possible—this is because, mathematically, in theory the infinite not only turns the possible into the impossible; the infinite likewise turns the impossible into the possible.

3.5.21. A contradiction of the infinite universe is that, theoretically, in the infinite even the possible-impossible is possible; therefore, in the infinite even the impossible can occur—whereas empirically only logical coherence is possible, at least within a margin of error.

3.5.22. The possible and the impossible in the infinite are identical within a margin of error equal to the inverse of infinity. Logically, if the infinite is infinite then the inverse of infinity is zero; therefore, zero margin of error in the infinite identity of the possible and the impossible.

3.5.23. Theoretically, in an infinite universe, everything—absolutely everything—and within that absolutely everything, both the possible and the impossible, that is, absolutely everything, whether possible or impossible: all the possible and all the impossible—is equally possible; and if, in an infinite universe, all the possible and all the impossible is equally possible, necessarily everything—everything possible and

everything impossible—is equally inevitable, in theory; because in practice whether something happens will depend on its being necessary—coherently logical—that it happen.

3.5.24. The dialectic is established upon the identity of contraries: the qualitative becomes quantitative and the quantitative qualitative; the subject becomes object and the object subject; the subjective becomes objective and the objective subjective; reality becomes an isomorphic idea and the ideal possible becomes reality; potential becomes act and act potential. The dialectic always has the same logic: the identity of opposites—which in *Impossible Probability* will be identical within the margin of error accepted by scientific policy—a logic that, in infinite universes, gives rise to the dialectical identity between the possible and the impossible.

3.5.25. In a truly infinite universe, every coherence that appears impossible—so long as it has a margin of reliability, logical coherence—will be real; reliability inversely proportional to the sampling or critical error accepted at the moment of truth.

3.5.26. Probability is the study of what happens, and what happens may be empirical or theoretical: empirically, what has happened happens; theoretically, absolutely everything can happen in a truly infinite universe. Truth is a matter of time: only time, in universes of infinite subjects or options, can render something avoidable if the time is insufficient or not infinite, or something inevitable if the time is sufficient or infinite. The dialectic of the possible and the impossible is, ultimately, a temporal function. Only—and absolutely only—in universes of limited options, universes limited to N options, is what does not exist absolutely impossible. The absolute impossibility of what does not exist is the condition of possibility for what does exist to be absolutely inevitable—in universes of limited options. The impossibility of what does not exist *a priori* defines universes of limited options: if the option "y" does not exist on a coin, it will never come up "y."

3.5.27. The way to intervene in the chance of history is through scientific activity.

3.5.28. Scientific activity, in a truly infinite universe, will in time determine the temporal sequences of study in which what happens is studied. The ***scientific planning of the political objectives of science determines the time periods*** of occurrence within

which possible events can be made necessary or avoidable, depending on whether science gives sufficient time for events to occur in reality or be avoided. The way science intervenes in the chance of reality is what determines what is possible or what is avoidable, in accordance with political objectives, within the accepted margin of error.

3.5.29. Critical reason must intervene in the chance of history through scientific policy; scientific policy, as a moral ideology, is essentially practical reason.

3.5.30. *The experimental method—founded on the hypothetico-deductive method—intervenes in the historical chance of the sequence of events it investigates by planning all its scientific actions in space-time, formulating a hypothesis and detecting variables, and controlling out-of-control events to reduce error and increase the reliability of the scientific procedure. Science must achieve the objectives of scientific policy.*

3.5.31. The objectives of scientific policy are founded on the ideals of its own ideology.

3.5.32. All scientific work is founded on guaranteeing reliability by minimizing the *Impact of the Defect*, accepting margins of error—margins of error within whose limits an empirical hypothesis will be accepted as a rational hypothesis. *Impossible Probability* and positivism are identical because they are founded on the positive fact; every positive fact is positive by occurring in space-time; only those positive facts that transcend beyond the present become historically transcendent positive facts—the truly historical fact.

3.5.33. The acceptance of an empirical hypothesis as rational comes to form part of a theory; a set of rational hypotheses forms a theory; a theory or set of theories forms a model; each model struggles to be the paradigm of science. The paradigmatic struggle of science is the scientific ideological struggle to be the paradigm of science.

3.5.34. Throughout history one can see how theories and hypotheses long held to be impossible—heliocentric theory, the Earth's sphericity, space travel, the human genetic map, robotics—have, at a certain moment, been shown true thanks to scientific work. Quite possibly many opinions about the more controversial theories or hypotheses of our time—*time travel, teleportation, cryogenesis, Artificial Intelligence superior to the*

human, human technological enhancement, extending human life in perfect conditions of strength, beauty, and health beyond any age limit, space exploration of the entire universe or of other universes, new forms of infinite and renewable energy requiring the least possible expenditure?—which are taken to be impossible, may fare the same; and questions we now take to be impossible may, thanks to scientific work, be possible—and, with adequate technological development, inevitable. The real question may not be whether they are possible or viable; perhaps the real question to ask is what the ethical direction of scientific policy should be when faced with matters of enormous moral and human significance.

3.6. Synthesis of the concept of *Impossible Probability*

3.6.1. *Impossible Probability* is a model of mathematical dialectical logic applied to probability. It originated on a spring afternoon in 2001, and its first phase lasted until 2004, although I made some contributions in 2005. The Second Phase of *Impossible Probability* has been more objective, where I developed fundamental concepts concerning error and the scientific–moral implications in decision-making. I began the Second Phase of *Impossible Probability* on December 19, 2009, starting to write this work on January 6, 2010—a work that began to gain autonomy with *Validity* on January 12, 2010; and, by the end of August 2010, early September, I prepared the various critical-probability tables presented in section eleven. The third phase of *Impossible Probability* comprises the theoretical contributions since 2011 toward a more positive vision of science. Philosophically, the fundamental contribution of the second phase is the dialectical logical identity among positivism, critical rationalism, and dialectical materialism [the fourth phase is GAI]. Opposites are identical because they are contraries. *Impossible Probability* is opposed to critical rationalism insofar as critical rationalism is founded on antinomy, whereas *Impossible Probability* is founded on dialectic. *Impossible Probability* is identical to critical rationalism insofar as, for *Impossible Probability*, we can only trust ideas critically contrasted with reality. Since reality is a subjective perception, a material, physiological substance, every contrast between the quantitative objective idea and the qualitative subjective reality—the contrast between the objective mathematical idea and phenomenal perception—is, in fact, a contrast of ideas: the contrast between the objective mathematical idea of

objective reality and the empirical physiological idea. The contrast between objective and subjective ideas is carried out by critical reason, which critiques the empirical hypothesis; the ideal critical reason is critical probability—calculated, in studies of error, on a percentage *X* of error divided by one hundred, and, in studies of reliability, on a percentage *X* of reliability divided by one hundred. *The ideology of science is progress*; the progress of science is progress in increasing the reliability of science; the idea of reliability is, in essence, a scientific ideology. *Science is, in itself, an ideology*; every political ideology implies a way of doing science; every science implies an ideology. *Impossible Probability* and positivism are identical because they are opposed: *Impossible Probability* is opposed to positivism insofar as positivism rejects the ideological variable of science, whereas *Impossible Probability* is a mathematical model in which every decision to accept or reject a hypothesis is a decision that depends on scientific policy—the ideological policy of science. *Impossible Probability* and positivism are identical to the extent that science is the study of the positive fact on the basis of logic, by virtue of which the unity of science is established. *Science is the negation of metaphysics*, insofar as science has overcome the fantastic explanation of reality in favor of an explanation of a positive nature. Science is the only possible criterion of truth. Both positivism and *Impossible Probability* are founded on the *unity of science* [GAI], or scientific unification [third, fourth, sixth phases in GAI], of all the sciences—social and natural—on the basis of the scientific method.

3.6.2. *Impossible Probability* is dialectical insofar as it is established on the dialectical thesis that insignificant factors can come to be transformed into determining factors. For *Impossible Probability*, absolutely everything of a scientific nature—within a margin of logical coherence—in a truly infinite universe, and in sufficient or infinite time, if necessary, will be inevitable. In theory, even the impossible may be inevitable [actually, GAI will unavoidable as soon as Superintelligence is achieved]; in practice, only what has a margin of logical coherence, though believed impossible, will come to be normal.

3.6.3. *Impossible Probability* is dialectical because it understands that absolutely every scientific possibility—no matter how improbable its probability, that is, close to zero or equal to zero, that is, close to or equal to *Impossible Probability*—in sufficient or infinite time, every scientific possibility, within a margin of coherence, no matter how close to

zero its probability may be, is an inevitable possibility in an infinite universe. Contraries are identical because they are opposites; in the infinite, the possible is identical to the impossible, and in the infinite the impossible is identical to the possible. If the possible, being possible, in the infinite is a possible impossible, then the possible, being possible, turns into an impossible possible. In the infinite, theoretically, everything can happen. Human limitation is the origin of error insofar as it prevents human beings from knowing the absolute as such; human knowledge is by nature partial, ideological—indeed a positive, sample-based error. In the infinite universe the part over the whole equals nothing; therefore the possibility of everything is zero. In the infinite, all and nothing are identical because they are opposites.

3.6.4. *Impossible Probability* is that probability equal to zero, and only *Impossible Probability* is the sole possibility which, being impossible, ought never to happen; and yet, in universes of infinite subjects or options, in sufficient or infinite time, as everything possible turns into *Impossible Probability*—probability zero—in the infinite, everything, absolutely everything possible, is theoretically transformed into nothing, while at the same time in the infinite any accident or contingency, however impossible it may seem, can happen theoretically—although in practice it depends on the logical coherence of the positive fact. An appearance is something that seems to be true but perhaps is not; something that seems impossible in an infinite universe is simply an appearance. Only rational ideas are politically reliable.

3.6.5. The theory of *Impossible Probability* assumes the number zero as the universal critical value; *Impossible Probability* is probability zero.

3.6.6. The number zero—that is, probability zero—is equal to *Impossible Probability*, and *Impossible Probability* is the universal limit of occurrence. In a universe of infinite subjects or options absolutely everything tends toward probability zero; in an infinite universe absolutely everything is *Impossible Probability*; in an infinite universe, *Impossible Probability* of error and *Impossible Probability* of dispersion or deviation. In the universe of infinite subjects or options everything is at once possible and impossible, because in the infinite there is zero error, zero dispersion. Zero dispersion in the infinite implies identity without margin of error between the possible and the impossible; only in the infinite is there the absolute identity of being and non-being. The

fact that human beings only know within error bounds—those set by critical reason and partial knowledge, the sample—means that human beings cannot know a reality without possible error, an endless reality; the inability to know a reality without possible error prevents human beings from knowing an infinite without inevitable end.

3.6.7. The human being, being finite, can only know partial parts of reality. A partial part of reality is, for example, a sample—whether a sample of subjects or options from an infinite universe, or a sample of raw scores or frequencies from a limited universe. A sample is only a part of reality. We cannot study infinite reality, only its parts; we cannot study the infinite raw scores or frequencies resulting from flipping a coin infinitely many times; nor can we study the infinite events of an infinite universe. Humanly, one can only study a part; a possible part of infinite reality is the sample. A sample is not infinite; therefore, in a particular sample, always—and absolutely always—the impossible in a particular sample will always be impossible for that particular sample.

3.6.8. In a particular sample only what happens in that particular sample is possible. Probability is the study of what happens, and in a sample only what happens in the sample happens; what does not happen in the sample is because it has been impossible in that particular sample. What has been impossible to happen in a particular sample has been impossible only for that particular sample, although it may in any case be possible in any other different sample. A particular, determinate sample is the sample of what is possible in that particular, determinate sample.

3.6.9. A determinate sample of the possible decides what is possible or impossible for that particular sample. In a particular sample only that which has probability different from zero will be possible, and in a particular sample what has probability zero—*Impossible Probability* of occurring in that sample determined by chance—will be impossible.

3.6.10. An impossibility in a particular sample does not imply that it is impossible in infinite reality; something may be an impossible event for one sample by chance, and be possible in a different sample by chance. The random structure of a particular sample determined by chance determines what is possible by chance in that particular sample determined by chance.

3.6.11. If, in a reality of infinite raw scores or frequencies, it turns out that an event has been impossible in one sample, that does not imply that it is impossible in all the possible samples of that infinite. It is possible that, in any other of the infinitely many possible random samples, what by chance was not possible in one particular random sample is possible. Only chance determines the possible sample; only chance determines what is impossible for a sample. What is impossible for one sample may be perfectly inevitable for any other sample; it is chance that causes the random distribution of the possible. In a sample selected at random, the inevitable will be inevitable by chance. Every possible sample is a particular distribution of the inevitable by chance, in that particular sample, among the infinitely many possible distributions of the inevitable.

3.6.12. In truly infinite universes, the possibility of infinitely many random samples can make it inevitable that what is impossible for a given sample may be inevitable in some other of the possible infinitely many random samples.

3.6.13. The first *condition* of possibility for an event to be possible in a sample is that the probability of that possibility be different from zero—even if it may be close to zero, an event of negligible probability; but in any case, whether the event is negligible or not, it can become determining.

3.6.14. The next *condition* for a possibility to be possible is that the possible sample of possible events be a sample of events in the time and space of occurrence of that possible event. If a sample of events is taken in any other space-time—sample space-time different from the space-time of a given event—that given event will be impossible for a sample that does not capture events from the space-time of the given event. Even if the sample did include events from the given space-time of a given event, the sample does not necessarily have to capture that given event, unless that event belongs to a population and the entire population is studied; because otherwise, if it is one event among many events in a given space-time, when a random selection is used, the sample does not necessarily have to include that particular event.

3.6.15. The sampling technique itself—the random selection of possible events—will determine whether an event is or is not possible by chance in the sample. A sample that

selects events at random may, by sheer chance, include some events in the sample and exclude other events from the sample. A possible random sample can, by chance, assign a possible probability to an event that occurred in the random selection, and deem impossible any other event that was impossible to occur in that random selection. Insofar as a technique is used—for example, random selection of the events in the sample by chance—the technique will describe a particular possible reality in which the sample of chance itself empirically determines what is possible and what is impossible for that particular random sample. Every sample theoretically selected at random is a sample theoretically at random and, empirically, a sample of chance. A theoretically random sample is, empirically, a sample that describes the behavior of chance in the sample. Every random sample is a sample of chance; every sample of biases by chance is a sample of the bias of chance. The Mean Deviation or Standard Deviation depends empirically on chance.

3.6.16. If the sampling technique is a technique that will describe what is possible or impossible—everything selected by the sampling technique being possible, and everything discarded by the sampling technique being impossible—then one may even commit the error of declaring an event impossible when it has simply been discarded by the technique, even though that event did occur in reality; but by the mere fact of not being selected by the technique, it becomes impossible for the sampling selection. Empirical chance can be influenced by the technique itself; two theoretically different random samples will display different forms of empirical chance, according to the empirical *behavior of chance* in each sample.

3.6.17. The same technique can, by chance, say that one event is more possible than another by selecting more occurrences of one and fewer occurrences of another, when, however, that selection of more occurrences of the same event is a product of chance; and in reality that event does not so much have greater occurrence in reality as that, by chance, more occurrences of that same event were selected. Likewise, one may say that an event has little possibility because fewer occurrences of that event were selected when, in reality, that event in reality itself has more possibility of occurring, but by chance the sample has not selected a sufficient number of occurrences to

determine realistically the possibility of that event in reality itself; thus the sample will not sufficiently represent the moral behavior of that universe.

3.6.18. One way to control, in inferential statistics, that the designation of the possible and the impossible in the sample be as realistic as possible is through random selection that includes, in the random sampling, the greatest number of occurrences; that is, the greater the number of subjects or options (in universes of subjects or options), the smaller the sampling representativeness error. In universes of limited options, the greater the quantity of raw scores or frequencies, the greater the representativeness of the sample of raw scores or frequencies, and thus the smaller the representativeness error of the sample—provided that from the very first measurement the ideal is not a sample of zeros. The smaller the sampling representativeness error—whether of subjects or options in universes of infinite subjects or options, or of raw scores or frequencies in universes of limited options—the greater the reliability of the sample. The greater the reliability of the sample, the greater the reliability in the decisions to accept or reject the empirical hypothesis; therefore, the greater the reliability, in the space-time determined by the sample, to make the logical, provisional inference about what is possible or impossible in the sample of chance of that space-time.

3.6.19. The conditions of possibility or impossibility

3.6.19.1. In an infinite universe, in all its physical dimensions, everything scientific—within a margin of logical coherence—whether deemed possible or impossible, is inevitable. Probability is the study of what happens, and in an infinite reality anything can happen— theoretically, even the impossible; empirically, what has logical coherence.

3.6.19.2. In a sample—whether in universes of infinite subjects or options, or of limited options—only what happens within the sample is possible. The sample delimits the partial limits of human knowledge: for human knowledge, only what is possible within the limits of human knowledge is possible. Everything outside the sample is impossible for the sample; everything outside our sample of knowledge is impossible to know within that sample of knowledge; because it is only possible to know what is within our

sample of knowledge. But what is impossible to know in one determinate sample of knowledge may even be inevitable to know in any other different sample. Everything within the sample is possible for the sample. Everything that is impossible for a given sample may even be inevitable for any other different sample.

3.6.19.3. First condition of possibility: **probability** different from zero. In a sample only what happens within the sample is possible; in a determinate sample only that possible probability different from zero is possible.

3.6.19.4. Second condition of possibility: **time**. Every possibility different from zero is possible within the time of the sample. Everything that has been impossible for the sample may have been impossible during the time of that sample, or perhaps it occurred in that time but was not selected by the sampling technique; in any case that impossibility may be even inevitable in any other time of any other sample of time. Any value judgment about the impossible in a determinate time-sample may be inevitable in another, different time-sample. **Every sample is a sample of time**; what in one time seems impossible in another different time may be inevitable. What can never be represented by any other sample is the case in which a particular event happened only once, a single time, and when it occurred it was not collected in the sample—either because it was outside the statistical criteria, or because the sample was selected at random—since then, of that event, it will never again be known whether it happened or not, if it truly had a single occurrence not randomly selected by the technique. If this situation occurs, then for the sample, that event—since it lacks any probability—would be an impossible event; although, in reality itself, it happened but was not represented by the sample, and thus forms part of the probability of sampling representativeness error, which is essentially the probability of error in the sample's representation of the moral behavior of the universe—a margin of error on which to establish the identity between reality and idea, accepting as a margin of error that the sample is not absolutely isomorphic to reality itself, insofar as sample and universe will only be identical within the margin of error we are willing to accept regarding sampling representativeness—the very reciprocal of the sample.

3.6.19.5. Everything that is impossible in a given space–time can be equally inevitable by chance in any other different space–time—except when an event happens only once. But even in that case, if it happens once and is captured in the sample it will have an empirical probability different from zero; and if it happens but is not included in the sample it will be an impossibility for the sample, while for reality itself it was inevitable, forming part of the sampling representativeness error. This means that something not occurring in the sample does not mean it did not occur in reality itself, since things can happen in reality itself that are not captured in the sample. The labor-force and unemployment statistics that governments publish in periods of economic crisis are statistics about the legally registered active population; however, insofar as that sample does not capture unemployment among undocumented immigrants, that is a reality that does not exist for that sample—although the fact that it does not exist for the sample does not mean it does not exist in reality itself—forming part of the moral behavior of society. Every sample is a spatiotemporal sample. Particularly, in universes of infinite subjects or options, scientific impossibility is only an appearance, provided there is a margin of logical coherence. The sample bounds the study in space and time; probability is the study of positive events—spatiotemporal events—de facto accepting the sample error of historical events; statistics is the study of chance and its history.

3.6.19.6. Third condition of possibility: **space**. A given random sample determines what is possible or impossible within the spatial domain of the sample's possible selection. What is impossible in a spatial sample may be impossible because perhaps it did not occur, or because it did occur and was not selected by the sampling technique. In any case, something that appears impossible in a given space need not have been impossible for reality itself, and may even be inevitable in any other spatial sample. Every sample is a spatial sample: what in one space seems impossible may in reality already have happened and was not selected by the technique, or may be inevitable in another space. The apparently impossible need not have been nor be truly impossible; impossibility is an appearance. Of the possible and the impossible we only know what rational critique reveals—and even then, since it rests on a margin of error (sampling representativeness error and the critical criterion), it will always remain an object of doubt and uncertainty.

3.6.19.7. Fourth condition of possibility: the **sampling selection technique**. A given feasible sample can determine that something is possible or impossible depending on the technique used to select the sample. What is impossible under one sampling selection may be even inevitable for some other different sampling selection. Every sample is a sample of the sampling technique; scientific technique is an apparent reliability. Whenever, in climate-change studies, different research teams report statistical figures about the consequences of climate change, the figures can be completely different depending on ideological orientation and on the kind of technique used in selecting information—on the basis of which each model of scientific policy reaches different conclusions. Whenever different space missions go to the Moon or Mars and report that there is water, in the form of ice, at the poles, the estimates of water reserves on the Moon or Mars differ according to the precision of the measuring instruments. In studies that use random-selection techniques, two different samples selected by the same random technique can nevertheless exhibit different statistical distributions, because the statistical distribution of each different sample—theoretically at random if the selection is random—is a statistical distribution of the empirical behavior of chance. An event that could have occurred but was not selected by the technique may be impossible for that sample, while the very same event may be inevitable in another sample that does select it. Chance can display two different empirical behaviors in two different samples, even when those two samples were selected in the same way. Theoretically identical samples can describe different empirical distributions of chance. The inversion of N is the sample at random; the Mean Deviation or Standard Deviation is the sample of chance.

3.6.19.8. Fifth condition of possibility: sample **magnitude**. What a given sample—of a number of subjects or options in infinite universes, or of raw scores or frequencies in limited universes—declares impossible may be even inevitable in some other sample with a different number of subjects or options (in infinite universes) or a different number of raw scores or frequencies (in limited universes). In the particular case of universes of limited options, the only impossibility that is absolutely impossible to occur in absolutely any feasible sample is the occurrence of an option that does not exist because it is not predetermined. If a coin consists of two predetermined options—

heads or tails—and the option “y” does not exist, then what will be absolutely impossible for every possible sample of coin tosses is the option “y.” Now, if for one feasible sample the option heads turns out to be impossible, the fact that heads is impossible in that sample does not imply it must be impossible in every sample, because there may be samples in which heads is inevitable. If, in a sample formed by successive tosses of a coin, tails turns out to be impossible, that does not imply it must be impossible for every feasible sample, because tails may be inevitable in some other different sample. Every sample is a sample of substances; what is substantial about the sample is its own material composition; the material form of the sample is in fact the sample itself. Something may be possible or impossible according to the sample magnitude N or the magnitude of raw scores or frequencies; the substance of the sample determines the empirical chance of the sample; two different substances will have empirically different chance behavior. A given sample magnitude never represents one hundred percent of the universe—only a part—and what one sample does not represent of the universe can be represented by another sample of different magnitude.

3.6.19.9. The definition of the possible and the impossible is thus relative to the magnitude of the probability (whether or not it is different from zero), to time and space, to the selection, and to the magnitude of the sample.

3.6.19.10. The fulfillment or non-fulfillment of any of these conditions of possibility makes a possibility inevitable or avoidable—for the sample. The ***survival*** of the human species may be inevitable or avoidable depending on whether the ***conditions*** of possibility necessary for human life are maintained. The moral conditions for human life are, essentially, ***freedom and equality***—free will with equal opportunities.

3.6.19.11. Individual events are products of chance; social events are ideological. The way to intervene scientifically in individual and social events is through science.